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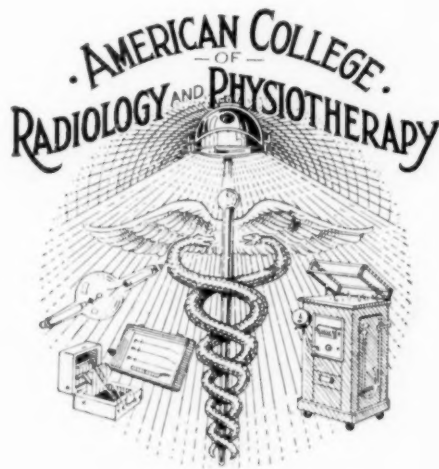
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Some Biophysic and Chemic Properties of Malignant Cell Metabolism, With Special Reference to Combative Therapeutic Measures.*

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Philadelphia.

THE path of science is, as someone has aptly said, "strewn with the bones of dead theories." Those which lie bleaching upon the road of cancer research are familiar to all, so we will waste no time at present in consideration of these, but, with due reference to the work of pioneer investigators, enter at once into the discussion of the research herewith presented, extending over a period of eight years.

While for many years cancer has been viewed as a definite pathologic entity, characterized by excessive embryonic cell proliferation with subsequent infiltration and (if unrestricted) fatal in termination, there has been put forth little or no tenable information regarding the initial stimulus necessary to bring about this well recognized pathologic picture and resultant prognosis.

Whatever this stimulus may be, it is of a nature invisible to our present day powers of microscopic magnification, and is undeterminable by any known chemical test, but is one which imparts its properties and powers to surrounding normal cells possessing them in turn with the stimulating influence for excessive proliferation and infiltration. A cell, becoming detached from this involved area, and being picked up by the lymphatics or carried by means of the circulatory system, migrates to another part of the body, and *possessing the properties which gave rise*

to the original neoplasm, establishes metastases in the new area.

From the time of first entering the field of cancer research, I have held to the "cause before cure" policy as the true scientific method of attack. However, other investigators, disregarding the cause, have immediately set upon the problem from the purely clinical side, and in doing so have opened up a far greater field for the experimental study of etiology than was ever anticipated.

Through the adoption of certain therapeutic agents, here I refer to the x-ray and the rays of radium, the investigator, probing the etiology of the disease, has been offered complex, yet definite material for entirely new lines of thought and research. Through the employment of these combative agents, we are forced to recognize the complex physical, and I might say, electrical, constitution of intracellular metabolism. If we disregard such a construction of our bodily cells we must likewise put aside the complex physical, and undoubtedly electrical action of the x-ray, the radioactive agents and the comparatively recent recognition of the colloidal state of certain elements and compounds.

When the beneficence of ray therapy in the treatment of malignant neoplasms was first recognized, the explanation was offered and adopted that such rays would bring about the destruction of tumor cells and by this means eliminate the growth, and to this day the majority of radiologists are willing to accept this explanation, disregarding other and more important phenomena. Those who

have worked extensively with radium know that the best results are not always preceded by a lethal dose, and I shall say here, and attempt to demonstrate later, that intense radiation is not essential to radiated tumor atrophy and disappearance.

Since 1898, advocates of ray therapy have consistently devoted their efforts to the perfection of administrative technique and determination of proper dosage capable of exerting destructive action upon the cancerous tissue, but leaving the healthy neighboring tissue *per se*; but until the complex intracellular metabolism, including the biophysics and chemistry, is understood and appreciated, we can never hope to bring about the self possessed and desired action of this valuable element in the treatment of cancer.

Let us at this point, in order to understand clearly the reasons for my deductions, briefly retrace the steps of my earlier research efforts, results of which have been given in detail in previous papers.

As an initial step, a consideration of plausible causative factors was undertaken, and traumatism offering, to my mind, the most logical explanation of the etiology of cancer, was naturally first considered. This investigation resulted in a confliction of the status of cause and effect, for, as far as could be determined, the bovine udder is immune to carcinoma.

Taking traumatism and chronic irritation as outstanding causative agents, what animal organ offers a more fertile field for the development of carcinoma than the udder of

*Read before the seventeenth annual meeting of the American Association for Cancer Research, Buffalo, N. Y., April 17th, 1921.

the cow? It is long, pendulous, placed far back, protruding between the thighs when the udder is full, subject to severe lacerations by the calf when sucking, friction, pressure when the cow is recumbent, injuries incidental to the life at pasture or in the stanchion, milking for ten or eleven months of the year. Surely, if uncompensated traumatism be a factor, the cow should furnish more cases of mammary carcinoma than all other domesticated animals grouped together. Hundreds of sections of the bovine and human mammae made at all stages of activity and quiescence demonstrated no histological characteristics to which the bovine immunity could be attributed.

Extracts of the udder were made, and, when injected into animals bearing standard laboratory strains of carcinomata, brought about a marked cellular reaction, for the tumors grew to a fatal termination much more rapidly than those of the controls. Thus, whatever rendered the udder an unfertile field for the development and growth of primary malignant neoplasms could not be transmitted to other species but acted as a stimulus to the atypical cell proliferation demonstrated in experimental carcinomata.

To this phenomena there seemed to be but one plausible explanation, that of acquired resistance and immunity; that the cells, exposed generation after generation to active secretory changes and excessive irritation had acquired a natural resistance against further injury, such as we believe to be responsible for the development of neoplasms among humans, and these cells, through such environmental conditions, possessed that factor which was stimulating to cell propagation. Thus, in a more concise form, whatever effect chronic irritation displayed upon normal cells, subsequently giving rise to malignant neoplasms, was possessed by the udder cells as the result of extended exposure to the many sources of injury mentioned.

Further consideration of this point leads me to believe that each organ and part of the human body, as well as of lower animals, is endowed with a special "index of resistance," determined by its exposure to that influence on intracellular metabolism that was brought about by the inherited effects of irritation, and from that time on a study was made of the various agents to which we could more or less directly assign a stimulating or inhibitory influence over cellular activities. This investigation has combined the studies of biol-

ogy, physics and physiological chemistry, the individual cell rather than the gross pathology of neoplasms being considered and studied.

Now to my mind the etiological theory, to be of value, must satisfactorily explain four outstanding points, enumerated as follows:

1st. If chronic irritation is a dominant factor, which point is undisputed, what is its secret? What hidden power of intracellular metabolism results from a maintained disturbance of a part or parts, and transmits its power to cells from a primary growth, enabling them to migrate and give rise to new growths? If this question is solved, have we not then found an explanation for the immunity of the bovine udder to carcinoma?

2nd. If we can directly assign the origin of malignant new growths to pre-existent embryonal cell rests, what belated influence is brought to bear in the later decades of life, stimulating the cells thereof to unrestricted and atypical growth rather than the formation of normal structures?

3rd. What is the true biologic action of the rays of radium—and if beneficial in the treatment of malignant neoplasms—to what property of these agents may we justly assign the development of malignancy among the earlier investigators?

Lastly—Is it a property of cell growth and metabolism, or mode of treatment, whereby some cases of malignancy readily respond to radiation, while others, equally malignant in character, fail after long and continued attempts?

In addition to these four considerations just outlined, a theoretical explanation for the various chemical disturbances accompanying malignancy must be logical. As the primary cause of these chemical alterations within the organism cannot be demonstrated in the laboratory, we must understand our physiological chemistry and explain its workings in physical terms, and by a reversed application of cause and effect work back to the factor or factors capable of bringing about the demonstrated altered "habit chemistry," or, in a fundamental chemical phrase, "the equation must balance."

Naturally, in balancing an equation we must have the sum of the products on one side equal to that of the resultant side. Thus, to balance the cancer equation, we have on one side the normal cell plus that power conveyed by chronic irritation, etc., and on the resultant side the electrochemical typical cancer cell, which,

like many chemical compounds on the resultant side of the equation, may be broken down to its fundamental components, each bearing their characteristic properties.

Limitation of time prohibits a complete explanation of the theory of "Cell Ionization" as brought forth at a much earlier time, and I shall here only abstract important points from my papers involving the theoretical considerations, in order that the experimental support may be clearly understood.

We are all familiar with the fact that histologically an individual "cancer cell" cannot be differentiated from a normal cell, and that the predominant property of such malignant cells is that of propagation and subsequent infiltration. Likewise, living matter is differentiated from lifeless by the property of the former to reproduce, which property is not possessed by the latter. Applying these known facts of oncology and biology to our problem, it is reasonable to believe that whatever this factor is which endows the formerly normal cells with excessive proliferative powers, it must be one of stimulation rather than destruction. Surely, dead cells cannot reproduce.

Returning again to the consideration of the radioactive agents as related to our problem, it appeared to me that we are dealing with agents, which, regardless of their ultimate action, were primarily electro-physical and electro-chemical. Here we have a minute particle of radium, giving off known rays, of determined wave-lengths and electric changes, and regardless of their action, as one of destruction or biologic rehabilitation, the action is directly one of electrical influence of these rays upon the proliferating neoplastic cell, for, as a general rule, the malignant cell is more "radiosensitive" than is the surrounding tissue. When we consider, at the present day and with our present method of protection, that principally those rays carrying negative charges of electricity, or those giving rise to negative electrons are liberated, I believe we are approaching the true explanation of the action of this agent.¹¹

Before the extensive knowledge of radiology now at our disposal was attained, pioneer investigators were listed among the martyrs to science by developing the disease which they were attempting to cure. Such cases of carcinoma, because in many instances it was true carcinoma, I believe, can be explained on the reasoning that they were continually exposed to the action of the alpha par-

ticles of radium, which are electro-positive in their action, but when we consider the short range of these particles, or positively charged helium atoms, it can be seen that the operator and not the patient was exposed to their action. If destruction of tissue was responsible for the origin of such cases of carcinoma, whereby the cells were stimulated to atypical proliferation due to the absorption of the products of cell death, an explanation offered by Ross, we could justly expect a tremendous stimulative effect to follow treatment of such conditions, where the destruction of tissue is many times that to which these workers were subjected.

These conclusions, together with the chemical considerations encountered during the development and progress of the disease, led to the belief and theory that carcinoma was due to a disturbance of the electro-chemical balance and union within the individual cells, which disturbance was directly due to a decrease of negative electrons or an increase of positive ions within the cell body, whereby the cell, normally electro-negative in reaction, becomes electro-positive and adopts the characteristic "habit chemistry" of the electro-chemical typical "cancer cell," however, this must not be confused with any conception of a histological typical "cancer cell," which cannot be differentiated from the normal. During the evolution of this so-called electro-chemical typical "cancer cell," the normal cell, undergoing malignant change, is forced to pass through three distinct phases of altered metabolism. The first of these I believe to be physical; the second, chemical; and the third, histological, or the final product, demonstrated microscopically, and when a sufficient number of these cells are involved, they give rise to that pathologic picture which we know as cancer.

With our present day knowledge of physical chemistry, we know that throughout the entire body there are a series of chemical reactions going on continuously and alterations in any one of these accompanying diseases will be manifested as diagnostic

symptoms for that particular pathologic condition. It must also be remembered that these reactions cannot take place without ionization and dissociation of the molecules composing the agents involved. Knowing that our bodies are composed primarily of cells, does it not seem reasonable to believe that any agent disturbing the equilibrium and normal, so-called, habit chemistry of these cells, must be of electrical nature?

Let us consider at this point, a group of cells, normal in every respect, being slowly acted upon by an exerting force (positive electrical stimulus) which would cause changes similar in every detail to those demonstrated in the first stages of karyokinesis. The cell, once stimulated, completes its cycle of division and forms daughter cells, according to the scheme of mitosis, which cells are identical with the mother cell. The force, still exerting its influence, eliminates the period of rest usually following cell division, and the daughter cells, just formed, are immediately compelled to undergo division. Thus, as long as a positive charge exists, stimulating mitosis, within a comparatively short time we would have a tremendous excess of cells, steadily and rapidly pushing forward, breaking down all bounds of normal retention and growth with the subsequent formation of the neoplasm and infiltration of subjacent tissues.

From theoretical study and experimental observations, it appears that a decrease in positive ions, or an increase in negative electrons within the cell, will result in a diametrically opposed action to that just described, i. e., inhibited propagation, resulting eventually in vital passivity, depending upon the intensity and period of action of the exerting negative charges. The severe burns and ulceration following the administration of large quantities of screened radium salts over a long period of time, I believe, serves as an excellent illustration of this point. By this method of radiation we are introducing into the tumor and the deeper normal structures tremendous

amounts of gamma radiation, which, as shall be discussed later, penetrates the tumor mass and normal structures alike, giving rise to secondary beta rays, or negative electrons.

To follow through the chemical alterations in metabolism is impossible at this time, so we shall briefly mention a few of the resultant chemical alterations accompanying carcinomatosis.

The nucleic acid of the normal cell nucleus, when functioning properly, is electro-negative in reaction. The cell receives its nourishment and oxygen from the blood, with which it enters into an electro-chemical union, due to the oxyhemoglobin of the blood, which is electro-positive in reaction. Thus, under normal conditions, we have a distinct and active ionization and dissociation of the molecules of the two elements, (nucleic acid, electro-negative; oxyhemoglobin, electro-positive), resulting in the supplying of the proper nourishment to the cell and the breaking up of the oxyhemoglobin with the subsequent liberation of its oxygen, necessary for proper oxidation changes within the cell.

In cancer however, where both elements (nucleus and oxyhemoglobin) are believed to be electro-positive, proper ionization, dissociation, and electro-chemical union of the two elements is impossible, with the result that the cells do not receive their proper nourishment and suffer malnutrition (cachexia). At the same time the oxyhemoglobin does not break up, liberating its oxygen, therefore, oxidation processes within the cell are greatly diminished, resulting in the accumulation of lactic acid. Likewise, many of the blood and urinary changes may be due, at least in part, to such an alteration.

With the accumulation of acid within the cell, there results an accumulation of water, colloids of the cytoplasm take up more water in the presence of acids, with subsequent distention and pseudohypertrophy of the cell. Swelling checks oxidation and blood supply.

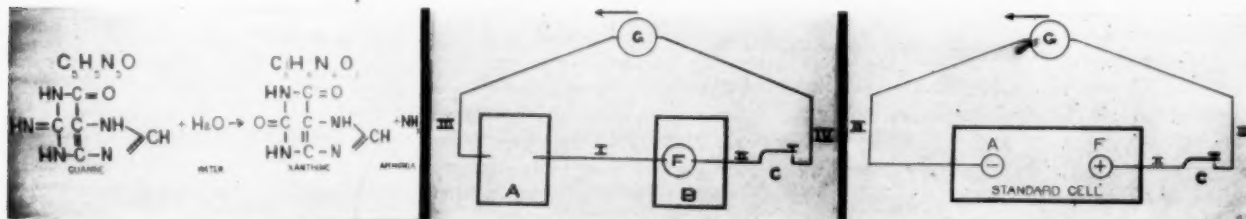


Fig. 1—

Fig. 2—Animal coupling: A, normal rat; B, tumor rat; C, single

contact key; F, tumor; G, galvanometer.

Fig. 3—Standard cell test for polarity of galvanometer.

Thus we have a progressive pathologic status established to which the "cancer cells" adapt themselves.

With the increase of water there is swelling of the cell which checks further oxidation, therefore it is reasonable to believe that the oxidation of guanine, which normally continues to the formation of urea, is checked at this point, resulting in an excess of xanthine and ammonia in the urine, and the decrease of urea, demonstrated by many workers (Fig. 1). As the proteins comprising the cells contain varying amounts of sulphur, we could, under these conditions, expect an increase in the unoxidized sulphur in the blood and urine. This condition has been very ably demonstrated by Greene.

If this purely hypothetic explanation bore a true relation to our problem, we could expect to find in metastatic growths the material for the experimental investigation, for reasons previously stated.

Through the courtesy and generosity of Doctor Woglom, I was able to establish the Flexner rat carcinoma in my laboratory, which tumor was used for all of the following experiments and verified by careful pathologic examination.

The first experiment undertaken was to determine, if possible, the polarity of normal and tumor cells. These experiments, as well as all others included in this report, were carried out by means of a high sensitivity galvanometer.

Taking two female rats, of the same litter, of known age and strain, one which I knew to be free from any pathologic condition, the other bearing an early developed carcinoma, I connected these much in the same manner as one would connect two batteries by means of a chemically clean, No. 30 German silver wire. One end I introduced into the normal rat, the other end into the healthy border of the tumor, free from necrotic matter. Then taking two pieces of similar wire, I inserted each terminal into a different portion of each animal. In the case of the tumor rat, one end was placed into the opposite border of the tumor from the wire connecting the two animals, the other end of the wire was fastened to the right-hand binding post of the galvanometer (Fig. 2). Another wire from the opposite side of the normal animal was fastened to the left-hand binding post. Upon pressing a single-contact key which was inserted in the circuit, I received a deflection of the galvanometer mirror to the left over a very readable distance on the gal-

vanometer scale. If my contention was correct, the animal bearing the tumor should act as the positive pole and the normal rat as the negative. To determine the correctness of this polarity, I connected the terminals in exactly the same order to the known poles of a standard cell (Fig. 3), which, upon completing the circuit, deflected the galvanometer mirror in the same direction but to a much more marked degree than did the animals. By reversing the electrodes in the animals or at the binding posts of the galvanometer, or by means of reversing switches, deflection in the opposite direction was brought about. This experiment has been repeated some 200 times, and with but one exception, where explicable conditions interfered, has always displayed the same results, even though the animals be separated by a distance of fifteen feet.

The possibility of interference due to thermal changes, thermocouples, degree of anesthesia, and other important considerations which my limited time prohibits mentioning, have been eliminated by experiment. Therefore, due to the large number of times this experiment has been repeated, to the interfering factors incorporated, and to the uniformity of results obtained, I feel that I am justified in saying that *the tumor bearing animals have a greater or higher potential than the normal rats, which change in potential is due to an excess of positive charges or ions, or a loss of negative electrons, within the cells comprising the neoplasms.*

Realizing to the full extent the difficulties involved in the solution and explanation of a subject so complex as the one with which we are dealing, I have merely attempted to offer the most logical explanation as brought to my mind by the results I have obtained in my research, however, such explanations may be modified or altered by further experimentation and research.

Without doubt you have all wondered in what way such an altered potential could be brought about within a cell. Disregarding the comparatively few cases referred to among radiologists, where I believe we can directly assign their origin to the action of the positive atoms conveyed by the alpha particles, the manner in which chronic irritation exerts its influence is impossible for me to say, and the only explanation I have to offer is that of an altered neuro-electrical cellular control, as all impulses, whether voluntary or involuntary, are the result of electri-

cal conductivity. With this knowledge it is fairly reasonable to suppose that whatever governs intracellular metabolism must also be of an electrical nature, and that all properties of the cell, including the most characteristic, that of diversion, does not occur in the regulated, well defined schemes without a direct exerting stimulus and control. I now have under way a series of experiments upon the thymus of young dogs, which, together with an investigation on the physical basis of anesthesia, directed to this end, may add greatly to our knowledge of this point.

Regarding Cohnheim's conception of etiology, it does not seem to me that this explanation takes us very far, for, as stated before, it fails to explain the many years of quiescence these embryonal rests exist within the body, and why when stimulated to proliferation, they produce malignant tumors rather than normal structures. Regardless of the embryonal characteristics displayed by malignant tumors, we are in no way assured that there exists a biological relation between embryonal and neoplastic tissue structures. Regardless of the rapid growth factors exhibited by these two forms of tissue, we are forced to agree that the embryonal proliferation possesses, in the majority of cases, many times the proliferative powers of the tumor cells, yet are governed by a well regulated control over such activities. In the case of neoplasia, I believe the histological embryonal characteristics displayed by such conditions are due to the continuance of the exerting stimulating influence which does not allow sufficient time for differentiation of cells such as seen in well organized adult tissue.

That embryonal tissues possess some of the characteristics of neoplastic tissue is afforded by the work of v. Heppel, v. Tiesenhause, Fichera, and others, which demonstrated that limited growth, following injections of rabbit, chick and rat embryo into adult animals, took place, but demonstrated no malignant characteristics, in the form of metastases.

Thus we are forced to draw a distinct line between these two forms of tissue, as any explanation of etiology, based upon the pre-existence of isolated groups of embryonal cells, takes us no further in our search of that agent responsible for stimulation than if they developed in adult structures.

Personally, from theoretical deductions and actual experimentation, I have no reason to doubt that neo-

plastic and embryonal tissue are physically alike in so far as their electrical reactions are concerned, but there is also little doubt in my mind that the former lacks that factor possessed by the latter, i. e., well regulated intracellular control and metabolism, or in other words, embryonal tissue is possessed with that factor of proliferation (positive electrical state), but lacks the factor necessary for continuance of propagation, i. e., positive stimulation, supplied by chronic irritation through an altered neuro-electrical cellular control.

Let us grant that malignant tumors do take their origin in isolated groups of embryonal cells, which, being remnants of rapidly proliferating but governed tissue, necessary for the formation of the embryo, exist in a positive state. Such cell rests might exist within the body for many years, or until further positive stimulation was imposed upon them by means of repeated arterial congestion, as Cohnheim himself suggested. We, of the present day, know that the oxyhemoglobin of the blood, especially arterial blood, is one of the strongest electro-positive agents within our bodies and by this means, the previously quiescent embryonal cells adopt the full characteristics of the electro-chemical typical cancer cell, previously referred to, and, not being surrounded by cells endowed with the physical and chemical properties necessary for differentiation and maturity, and, deprived of their normal nerve controlling factors, tend to form malignant growths rather than normal structures.

However, were Cohnheim's explanation correct, we could expect the occurrence of malignant tumors distributed at random throughout the body, and could therefore disregard the importance of continued irritation as bearing any relation to our problem, for it would be very unlikely that these rests would exist in localities where years of observation have proved without doubt that irritation is responsible for tumor formation.

The two remaining considerations to be presented have already been discussed from the theoretical standpoint, and I shall now offer substantiating facts obtained by animal experimentation.

This work only involves the consideration of carcinomata, other forms of neoplasms have, to this time, been disregarded.

The galvanometer used for the final determination, after an initial or preliminary test, has a sensitivity of 8,803 megohms and an external

critical damping resistance of 21,000 ohms, which eliminates any possibility of variation in deflections as being due to any resistance created within the animals. Therefore the results obtained are, without question, due to variation and alteration of potential within the tissues involved.

Many of these experiments have been made possible by the valuable cooperation of Doctor F. C. Benson, Jr., Radium Therapist to the Hahnemann Hospital, and Professor of Radium Therapy at the Hahnemann Medical College in Philadelphia. All pathologic sections were carefully examined and diagnosed by Professor Damiso Rivas, Professor of Parasitology at the University of Pennsylvania. To Doctors Benson and Rivas I am greatly indebted for their able assistance.

If neoplastic tissues possessed a greater or higher potential than normal tissues, due to their existence in a positive electrical state, we would naturally expect the greatest therapeutic effects to follow the induction and action of negative electrical agents or electrons.

In support of this conception the following research was undertaken.

In the first series of experiments, the effects of radium emanation emitting principally beta radiation was studied.

Animals connected as previously described, and displaying the characteristic deflection, i. e., to the left on the galvanometer scale, were allowed to react for sufficient time to offset any possible unaccounted for variation in deflection to take place. This point being secured, radium emanation seeds were introduced into the pathology at such distances from the electrodes that the tissues immediately surrounding the seeds might receive the maximum beta radiation, but at sufficient distance not to be influenced by the direct action of the rays, and in this manner any alteration in deflection should be due to alteration of cell potential alone.

Marked effects on deflection were produced immediately following the introduction of a single, one millicurie, seed, reversing the current flow to the opposite direction, brought about by a momentary supersaturation of the tissue with free negative electrons, but, due most probably to the bulk of the tumor, with its increased cellular potential, the effects were rapidly overcome and deflection was reestablished in the same direction as before starting the experiment. In most cases, four seeds were employed, each one in turn, as the result of accumulated action, exerting its in-

fluence over a longer period of time and causing the tissue, formerly electro-positive in reaction to become electro-negative. Following completion of the readings, the seeds were removed, so, in all cases the animals received dosages between fifteen and thirty-one millicurie hours (Fig 4).

Sections taken immediately following such radiation showed no histological difference from those presented before the seeds were introduced, but in a week or ten days, sections taken, showed a marked histological and biological alteration, thus clearly demonstrating that the first step in rehabilitation was performed immediately, i. e., the physical, but that time was required for such cells to be readjusted chemically and histologically to normal.

In the second series, the effects produced by the introduction of radium needles was studied. The radium element within the needles employed throughout this series was so screened as to allow a preponderance of gamma radiation to penetrate, while the beta rays were practically all absorbed. The experimental procedure was identical with that employed in the first series, the only difference being the type of radiation studied.

Needles containing approximately one milligram of radium element were introduced in the same localities as the seeds, but of course into different animals from those treated with the emanation. Alteration in deflection failed to show more than a slight initial reaction which I now believe to be due entirely to the liberation of secondary beta rays formed within the needle's wall (Rays of Sagnac), (Fig. 5).

Sections of tissue, taken at the same periods of time as in the first series, demonstrated an altered cellular reaction several days following radiation, but the biological change was by no means comparable to that produced by beta radiation from the emanation.

This series demonstrated that the initial physical alteration due to gamma radiation was practically nil, and I believe the only beneficial property that we may justly assign to gamma radiation is that of an efficient transporting medium and excitant for secondary beta rays, and it should only be employed where penetrability of tissue is desired. Where the bulk of pathology can be reached by primary beta rays, I do not think the employment of gamma radiation is practical or advisable, for by this method we are inducing into the underlying healthy tissues

negative electrons, conveyed by the penetrating gamma rays, a point that should be emphasized and guarded against.

The third series undertaken was limited to the study of the alpha particles emitted from polonium, or Radium F.

This series has but recently been started, but from the limited amount of work done to date, I feel will give rise to some valuable information in our conception of cause and cure of cancer.

In one experiment, a small copper disc, coated on one side with polonium was inserted subcutaneously on the backs of normal animals, with the polonium surface up.

Sections taken after five days exposure to the action of these particles, demonstrated a stimulating influence upon the epithelial elements involved, in the form of hyaline changes and hyperplasia of the outside epithelial lining of the hair follicles which penetrated the muscular tissue. There were small groups of imperfectly formed epithelial cells, and the whole picture, according to Professor Rivas, demonstrated a change suggestive of taking on malignant characteristics.

The animals became very anemic, with a drop in hemoglobin content to thirty. This was accompanied by a tremendous loss of weight and strength. Thus clinically, they demonstrated a picture of advanced malignancy.

What the final outcome of this will be, I cannot at this time say, but it shall be watched with great interest and subjected to the close observation, as were the other series. There are still many points to be determined in the study of the biologic effects produced by the alpha particles which will be resumed upon my return to Philadelphia. Whether or not malignant neoplasms may be produced at will by this method of treatment remains to be determined, and will necessitate a most careful and extended consideration and experimentation. Realizing, however, that the outstanding factor for true malignant properties of experimental tumors is that of successful transplantation into other hosts, and the power to metastasize, this point will be carefully investigated.

In an effort to clinically substantiate my experimental results of series one and two, I consulted the case histories in the Radium Department of Hahnemann Hospital, and was able to find record of several cases of surface epithelioma and carcinoma which received varying treat-

ments with radium element, but failed to show response, and were believed to be resistant to the action of radium rays. During periods of from 4 months to three years' time, these cases received dosages from 62½ M. H. (milligram hours) to 100 M. H. per cubic centimeter, so screened as to allow principally the passage of the gamma rays. Later attempts with unscreened radium emanation in seeds, with dosages varying from only 9 m. c. hrs. (millicurie hours) to 15 m. c. hrs. per c. c. showed marked beneficial effects. These cases are believed to be well on the road to recovery, and the benefit received from the fractional dosage of emanation to be due entirely to the action of the negative electrons (the beta rays), neutralizing the excess potential demonstrated, and restoring the cells to normal metabolism and "habit chemistry," which, together with an increased fibrosis will eventually result in a complete elimination of the condition locally, and, in the absence of previous dissemination, a clinical cure. However, as many cases succumb to metastases, not accessible to direct radiation, we are forced to seek an agent capable of absorption within the body, possessing at the same time, the necessary element to bring about the desired physico-chemical change within the cell body.

Based upon theoretical deductions and gratifying results I have obtained experimentally, and clinically in cases of advanced carcinoma among humans and my experimental animals, I believe this agent may eventually be found in the anionic colloids (negatively charged and passing to the positive pole). Thus, if our metastatic "cancer cell" is electro-positive we would hope to neutralize its increased potential by induction into the body of a negatively charged agent, which may be absorbed by the cell to capacity, with easy elimination of the excess. Many advanced and apparently hopeless cases of carcinoma have been treated by means of colloidal sulphur, iodine and selenium, each of which is anionic in nature, and our results to date have been encouraging, but as the period of treatment and observation is still under that demanded for the so-called "time-test, I will refrain from any detailed report at this time.

In concluding, I believe the following conditions have been explained, and form a foundation for continued and extended research and study:

1. That malignant tissue has a greater or higher potential than normal tissue, due to the loss of negative electrons or an increase in positive ions.

2. The resultant state of intracellular metabolism brought about by chronic irritation, will, if continuous, generation after generation, result in an electrical balance of the cells, resistant to positive stimulation. In this way the immunity of the bovine udder to carcinoma may be explained, also the rarity of cancer involving the palm of the hand or the sole of the foot may be accounted for. This condition establishes the "index of resistance," referred to in the text.

3. That for a normal cell to become cancerogenic, or in other words, become the electro-chemical typical cancer cell, it must pass through three stages of intracellular metabolism; the first, physical; the second, chemical; and the third or resultant, histological.

4. That alteration of the physical components of the cell, gives rise to the characteristic chemical alterations demonstrated accompanying the continuance of malignant processes.

5. The likelihood of the pre-existence of embryonal cell rests is very remote, but if such groups do exist, they do so in the physical form necessary for the first change from normality to malignancy but lack the two remaining alterations and qualifications of the cancer cell, i. e., chemical and histological change until such time as further physical change is brought to bear in the form of positive stimulation.

6. That for cells from a primary growth, to give rise to metastases they must be endowed with the properties and power which gives rise to the original neoplasm, and must possess the "habit chemistry" of the electrochemical typical "cancer cell."

7. That the beta rays, or negative electrons are the ones responsible for biologic change, and these, by neutralizing the excess potential within the tumor cells, bring about their desired therapeutic action, hence neutralization rather than destruction is our ultimate goal.

8. That the biologic action of gamma rays is practically nil, and the noteworthy attribute in the treatment of malignant neoplasms is their penetrability and the fact that they serve as a vehicle for secondary beta rays.

9. That from the induction of excessive negative electrons, result: erythema, inhibition of cellular activities, cell degeneration and death.

This point may account for the burning, ulceration and constitutional reactions developing as the result of long, continued and intense radiation. The last of these, including nausea, vomiting, depression, etc., being due to the absorption of the products of cell death by the entire organism.

10. That the alpha particles, positively charged helium atoms, are to

a great extent responsible for the cancer among the earlier radium workers.

Finally, that the possibilities offered in the future by a combination of radium and colloidal therapy, I believe, are very promising. In both cases we are introducing into the body electro-negative agents; locally, by means of the beta rays of radium

(electrons), and constitutionally, by the administration of the anionic colloids, negatively charged particles, possessed with the property and power of penetrating the cell mass and exerting a negative influence upon the intracellular elements, thus neutralizing the migrating cancer cell before it is enabled to give rise to metastases.

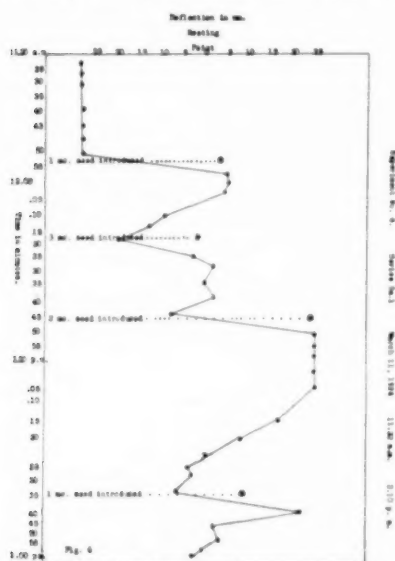


Fig. 4—At 1:00 p. m. (see chart), coupling wire removed, no deflection. At 8:10 p. m. all seeds removed FRC/11 H.

Fig. 5—No legend.

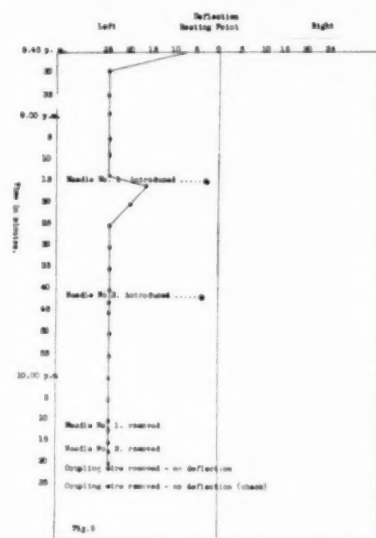
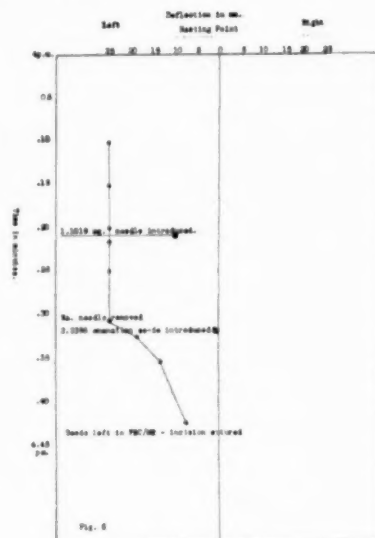


Fig. 6—Illustrating the absence of potential alteration from gamma radiation and the reduction of potential following the introduction of radium emanation seeds (beta rays), into the same tumor.



The Treatment of Malignancies by the Use of Surgical Diathermy and X-Ray.*

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The treatment of cancer whether it be medical, surgical, x-ray, radium or electrocoagulation has not reached perfection in all types and in all stages of the disease. The physician who can use any or all of the above mentioned methods when properly indicated is the one who is best fitted at the present time to fight the battle of the suffering cancer patient.

Ever since radiation was first recognized for the treatment of cancer the surgeon has referred to the radiologist the worst wrecks wrought by this dreaded condition. For years this effort on the part of the radiologists to check the ravages of the inoperable case has assisted in keeping in the background the real value of this mode of treatment. Nevertheless something had to be done for the suffering patient, and the radiotherapist, even though failure seemed the rule, continued to make improvement in technique and so, with the aid of the manufacturers of apparatus and physicists there has been a great advance in the treatment of malignancies. As a result, radiology has made more advance than any branch of medicine during the last twenty years.

When an inoperable case appears before us, the patient beyond the aid

of any treatment, it makes us realize that there was a time in the beginning of this dreaded disease when satisfactory treatment would have prevented his present terrible condition, hence, we feel that the general practitioner and particularly the patient himself, carries a great responsibility in directing the right treatment to cure these conditions. The fact that the surgeon and the radiologist has each continued to give treatment to the apparently hopeless case, while being stimulative to greater advancement, has nevertheless, driven from us many early cases that could have been cured, but the patients drifted hopelessly along waiting until too late or finding their way into the hands of incompetent aid. Too often the average physician will pass up the small beginning lesion, which is readily removable, with a remark to the patient which leads him to think it is of no importance and can be ignored with perfect safety. The patient also is responsible many times for delay and thinks he will not bother the small growth until it begins to bother him.

ELECTROCOAGULATION AND SURGICAL DIATHERMY.

Electrocoagulation is the coagulation of diseased tissues by the Oudin current or one pole of the d'Arsonval current and is to be used for small superficial lesions.

Surgical diathermy is the application of the high frequency currents

for the destruction of tissues by the heat produced through the resistance offered by the tissue through which the current is forced, without sparking. The treatment differs from the application of the electrocautery or other applications of heat in that the heat with the latter methods is applied from without and does not have much penetrative power. The heat is generated in the tissues themselves and the temperature of the diseased area may be readily raised to a point of coagulation. Therefore it is the penetrating power of this heat which is more beneficial than the thermic cautery, which destroys only by transmitted heat.

Surgical diathermy is produced by the bipolar method of the d'Arsonval current, and should be of low voltage, high amperage and extremely high frequency. The indifferent electrode is a piece of block tin about eight inches in diameter and is strapped to the patient's back or shoulders. This electrode may be wet with a soap lather or used dry. The main object is good contact, and strapping with a good canvas binder is all that is needed. The active electrode is smaller and either made up of a point or some other suitable electrode as to the shape and size needed.

In surgical diathermy or electrocoagulation it is necessary to use an anesthetic of some kind. For the superficial lesions which are not too large, a local anesthetic such as no-



Figs. 1 & 2—Epithelioma near the ala of nose before and after treatment by surgical diathermy.

Figs. 3 & 4—Epithelioma near ala of nose before and after

treatment by surgical diathermy.

Figs. 5 & 6—Sarcoma of lower central region before and after treatment by surgical diathermy.

vocain or some similar preparation is used. For the larger lesions we use hyoscine and morphine and find H. M. C. satisfactory. The one-fourth morphine size is given about 40 to 60 minutes before starting, and the one-half size or another full dose is given upon starting, with sufficient chloroform to produce necrosis. Ether is not satisfactory on account of the danger of explosion, especially when working about the face.

There is very little postoperative shock to surgical diathermy and on this account it is especially valuable in the aged. My oldest patient was 94 years of age and had practically all the lower lip removed and part of the upper without any shock and remained in bed only over night. There is a wonderful alleviation of pain. This is almost immediate after recovering from the anesthetic.

The local application of sufficient heat to the tumor mass destroys the growth. The use of a lower degree of heat to the periphery of the tumor and beyond its limits results in the inhibition of the growth of migrating cells. The dissemination of these cells throughout the organism is further prevented by the occlusion of the lymph spaces and channels, and further by the formation of scar tissue which forms a most desirable barrier against the new growth. By diathermy the deep penetration of the high degree of heat destroys, or at least inhibits, instead of stimulating the neoplastic cells in the zone just beyond the periphery of the tumor mass. Surgical implantation of the tumor cells into healthy tissue is the unavoidable result of excision, and dissemination of metastases by the opening of lymphatics and blood vessels is not prevented.

On the other hand the lymphatics and blood vessels are closed and metastases are not produced. By this method there is no possibility of transplanting or implanting cancer cells into new tissue. There is less likelihood of recurrence following diathermy. The dosage is accurate and, owing to the extreme heat, there is absolute sterilization of the wound and the growth is removed as a necrotic mass.

There is less tissue sacrificed than by surgery and there is ordinarily a good cosmetic result. If necessary to remove very large areas it may be necessary to do some plastic operation, especially if on the lower lip. If it were possible to destroy a tumor mass by ordinary cautery there would be some danger of the burn producing a systemic poisoning but there is no absorption from the burned area in coagulation on account of the sealed blood and lymph vessels.

The postoperative condition leads to a quick recovery and during this period the unpleasant odor is one of the disadvantages of this method of treatment. Powdered sugar used on the charred mass aids very materially in reducing the odor and I have found that boiling some water in the room with a small quantity of lysol or similar solution added to the same is a good deodorizer. Another disadvantage to surgical diathermy is that there is no chance of saving blood vessels and nerves in close proximity to the disease. It is sometimes necessary to do a ligation before or after the treatment.

Any fissure or crust which lasts longer than a month should lead to the suspicion of malignancy and during this period the general practitioner has a great responsibility. Prac-

tically all cancers of the skin can be successfully treated by means of x-rays and electrocoagulation, provided they are treated early and skillfully. Precancerous conditions in the skin, warts, moles, etc., are best treated by coagulation. Early local destruction of all malignancies by surgical diathermy followed by high voltage x-ray therapy of the local lesion and the draining lymphatic areas should cure all such cases. The combined treatment of surgical diathermy and x-ray therapy offers better promise of a permanent cure than either alone. Poor technique with any form of treatment will usually lead to failure and recurrent carcinoma gives much less satisfactory results. It has been my practice whenever possible to radiate the area involved both before and after the surgical diathermy treatment and to also give another treatment after complete healing has taken place.

No tissue should be removed before treatment for diagnosis. It is better to have a lesion of long standing cured than to know the pathology and die from cancer.

CONCLUSIONS.

1. There is immediate relief of pain. Every case upon awakening will say that he has no pain.
2. Immediate sterilization of the wound as the heat destroys the mixed infection and foul discharges.
3. Much less danger of extension and metastases than by surgery.
4. There is no shock and practically no hemorrhage.

The accompanying illustrations show the appearance of patients both before and after treatment, and are illustrative of some minor conditions which were treated by this method.



Figs. 7 & 8—Extensive ulcerating epithelioma of right cheek before and after treatment by surgical diathermy.
Figs. 9 & 10—Epithelioma of dorsum of hand before and after

treatment by surgical diathermy.
Figs. 11 & 12—Epithelioma in axillary region before and after treatment by surgical diathermy.

The Interpretation of Dental Roentgenographic Shadow Changes.*

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THE interpretation of roentgenographic shadows must necessarily vary with one's power of sight and perception. It also varies with the individual interpretation the observer may put upon what he perceives. As there are differences in opinions and differences in ideas, there are as many differences in the explanation of what is seen in the roentgenogram and its significance as there are observers. This is more pronounced when it relates to x-ray findings as a causative factor in disease.

There are still those who believe that all devitalized teeth are infected, and that every alteration of shadow portrayed about a tooth is significant of infection which should be summarily dealt with by surgery. There are those who believe the opposite, that no matter how large the visible area of destruction is, it does not indicate radical procedure, because in some of these areas no active organisms can be found. Then there are all grades of differences intermediate between these two extremes, and each has its adherents.

The interpretation of the roentgenographic shadow, once such interpretation is to be used as an index of a pathological condition or focus, will find a variety of explanations. Therefore, there is only one safe procedure. It is the omission of any attempt to determine activity or inactivity of germs, and the interpretation of such differences as are pictured in an area, in their relation to the same area as pictured at such times as is considered normal.

The roentgenogram does not picture pus as the result of infection alone, for there is no different shadow cast by pus as an inactive debris of putrefaction and pus the result of infection. Such difference cannot be pictured, and can only be interpreted in conjunction with other findings and particularly the clinical history of the case.

It is fallacious to attempt the explanation of the clinical symptoms of a case from a dental roentgenogram, forgetting to view the case from all angles and especially the case history.

As a local index of a purely local condition or for the explanation of definite symptoms which are purely local, the dental roentgenogram, when properly taken, will give the true picture of bone conditions. These findings must be interpreted. It is true that findings can be classified and in this connection statistics have pointed out that some findings are more often found in conjunction with certain symptoms. However, the converse should not be considered as being always true.

It is necessary, in conjunction with the knowledge of the normal bone appearance, to understand what conditions can arise and what the result of any condition is when it affects the parts locally. A review of the local pertinent anatomy would be helpful.

The greatest proportion of blood and nutrition is supplied to the tooth through the blood-vessels within the root canal and pulp chamber. The lesser portion is supplied through the peridental membranes which surround the tooth and are between the tooth root and the alveolar socket wall.

Let us first consider what happens in an acute process and what roentgenographic changes would result. Until such time as the congestion develops to the point of impediment of the circulation within the canal or pulp chamber, there can be no change pictured roentgenographically. Within the canal and pulp chamber the alteration of circulation to the point of stagnation permits of an easier penetration of light rays and a greater registration of rays than in a correspondingly normal and similar area. This makes the difference in registration in Grade I shadow and the surrounding Grade IIb shadow more marked, so that the root canal and pulp chamber shadow is more clearly defined and distinctly outlined. Grade I shadow, as was explained in the early paper of the series is the result of penetration of soft tissues, while Grade IIb shadow results from compact bone penetration.

Passive congestion, therefore, will be indicated by an increase in the intensity of the Grade I shadow. If congestion exists in a root canal or pulp, such tissues will allow more roentgenographic penetration through that area and there will consequently be a greater deposit of silver salts on the dental x-ray film in the position of those rays which traversed that tissue. This would make the difference between the soft tissue element of a tooth and



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

*Received for publication May 26, 1924.

bony structure more marked. When the contents of a root canal and pulp chamber become putrid, then there is even a greater difference to be noted. The continuation of the putrid condition causes a congestion and further irritation of the peridental membranes, especially apically, the congestion which results here causing a thickening of the soft parts. These soft parts are walled in on one side by dense bone structure, the tooth root, and on the other by the alveolar process, which has a thickened socket wall or lamina dura. Continued pressure here causes degeneration and absorption of tissue. As the tooth substance is the more dense and more resistant, it is most often the alveolar process which shows the first signs of absorption.

In the roentgenological diagnosis of an acute condition in a tooth, early congestions *may* be noted through the finding of a difference in pulp-tissue shadow. This, however, can more often be noted after the pulp tissue has become putrid. The next important change which may be noted would be the appearance of the peridental tissue, and its relation in intensity of shadow to both the tooth root and alveolar process; a difference in peridental shadow (Grade I) relation to tooth root shadow (Grade IIb) and alveolar shadow (Grade IIa).

The explanation in these instances must of necessity be lengthy, for it is impossible to portray the finer details of shadow which must be recognized to make a diagnosis. So illustration of this point will not be attempted.

The continuation of the process above described results in the destruction of the alveolar process, first periapically, as is often portrayed, and then about the root in any direction or in all directions. It most likely follows the line of least resistance, and if an infection, the channels of absorption. The resistance which the patient can bring to bear against a destructive process will govern its size which in turn

governs the appearance in a roentgenogram. As previously stated, areas indicative of destruction cannot be definitely declared to be areas of infected material. These areas may contain only a thickened membrane or sac where active organisms may have been present. Their pathology may be better explained as a source of irritation, producing toxic material, which in turn may be the cause of symptoms.

Figures 1 and 2 picture well defined and well walled off areas. In both of these instances there is a well defined alveolar socket, which can be traced along the root and only at the apical end shows a change. Instead of the shadow of the alveolar wall,



Fig. 6.

the lamina dura continuing closely about the apex, the root apex seems to be free in a rarefied area. Both these teeth have had their pulps removed and root canals have fillings in them. In Figure 1, at the time this picture was taken, there was a discharging sinus under the lip in the position of this cuspid tooth. The patient did not recall having had any swelling of the parts recently. A well defined sac with active organisms was removed in this instance. In Figure 2 there were no active organisms demonstrated.

Figure 3 pictures a less well defined or walled area about the roots

of these teeth. Destruction has taken place well up to the alveolar ridge. Evidently this process was aggravated by the puncture of these roots which has resulted from the placing of the pins in the roots for the support of the crowns. In this instance a badly inflamed gingiva was to be noted and about both teeth the membranes were found greatly thickened.

Figure 4 pictures a cyst formation. This process had its origin at the root apex and evidently continued in the line of least resistance. This is the picturing of the condition from which cysts develop. In the removal of conditions of this character, the removal of the tooth without the complete evacuation of the contents of this pictured necrotic area does not stop the process. It requires complete removal.

Figures 5 and 6 are of the same patient. The one picture being on a dental and the other on a larger film held in the occlusal plane in the patient's mouth. In this case a periapical area about the size of that shown in Figure 4 was pictured eight months previous to the time of taking this picture. At that time the root, which was in the position of the left upper lateral incisor, was removed. The area healed over. The patient's symptoms continued and she was again referred for picturing, the films here reproduced were then taken. This patient was entirely relieved of her symptoms after the removal of this large cyst.

The clinical findings and the operative procedure which was found necessary, are recited here to assist in substantiating the comment previously made, that a rarefied area in the alveolar shadow does not merit the interpretation of the presence nor the absence of pus. The term pus has been too loosely applied and from the fact that many times at operation there is no pus (as a pus flow) demonstrated, criticism of the roentgenographic diagnosis is made by either the laity, the profession or both.



Roentgenological Diagnosis in Diseases of the Alimentary Tract.*

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IT HAS been said that the stomach is the greatest liar in the human anatomy, when viewed as the spokesman of the abdomen. We all know that when most any one of the abdominal organs is diseased, the stomach will register complaint, or, in other words, the bell rings in the stomach.

Dr. W. A. Evans says, "For more than ten years I have had a hundred or more people write me each day. The majority of them write me about their ailments, and more complain of indigestion than of any other affliction, in fact many more—possibly twice as many as complain of any other symptom, and of those who complain of indigestion, fully 90 per cent have no thought other than that the stomach is the only organ involved."

Nowadays it is not enough to make a diagnosis of indigestion, but the seat of the trouble must be found, and rarely is the stomach itself at fault, even in the presence of hematemesis, but it simply rings the bell or sounds the alarm when disease appears elsewhere. One who has a clientele of so-called "indigestion" cases referred for x-ray diagnosis, must be struck by the fact, as I have been, that a large percentage of individuals suffer from gastro-intestinal

complaint during some period of their life.

I am not prepared to state whether diseases of the alimentary canal are more frequent today than during the period of King Tut, but it seems at least that this complaint is one of the most fruitful fields contributing to the support of our noble profession.

About two years ago I became interested in the statistical study of diseases of the alimentary tract, and as a result I sent out a questionnaire to leading gastro-enterologists and roentgenologists throughout the medical centers of our land. From these replies I made a percentage average, and will submit the figures for your consideration, as they will give us an idea of what to expect if we but remember which are the frequent and which are the infrequent conditions, and thus lend aid to a diagnosis when combined with carefully taken histories and other routine methods. Twelve men replied to the questionnaire, and their reports cover a series of over 30,000 cases which were checked by operative and postmortem findings to a large extent. The questionnaire was as follows:

1. "What percentage of individuals seeking relief from gastro-intestinal complaint in your clientele are diagnosed as having organic gastro-intestinal pathology?"

The average answer was 64 per cent. Or, that six people out of ten whom we see from day to day, with symptoms of indigestion, have gastro-

intestinal pathology. The remaining 36 per cent, evidently, are suffering from something else, producing these same symptoms, probably cardiac insufficiency, renal disease, bone lesion of the spine, neuroses, etc. Inasmuch as this latter classification is not under consideration, we will eliminate it and give our attention to the original 64 per cent.

2. "What percentage of these cases (64 per cent) has stomach pathology?"

The average answer was 10 per cent, practically divided between ulcer and carcinoma, with six cases of ulcer and four of carcinoma.

3. "What percentage shows duodenal ulcer?"

The average answer was 15 per cent.

4. "What percentage shows gall-bladder pathology?"

The average answer was 15 per cent.

5. "What percentage shows appendiceal pathology?"

The average answer was 30 per cent.

6. "What percentage shows colon pathology?"

The average answer was 7 per cent, the same being divided into carcinoma, tuberculosis and diverticulitis.

7. "What percentage shows esophageal pathology?"

The average answer was 3 per cent, the same being divided between carcinoma and diverticulum.

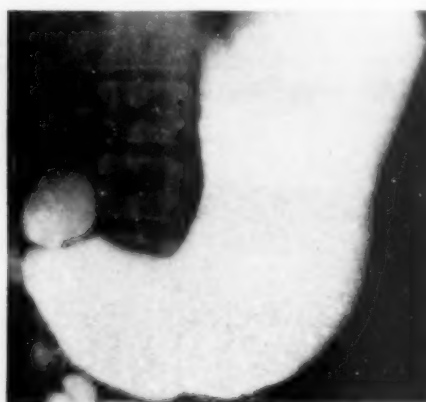


Fig. 1—Normal stomach and duodenum.

Fig. 2—Gastric ulcer showing niche of ulcer on lesser curvature

with incisura opposite on greater curvature.

Fig. 3—Hour glass stomach from indurated ulcer.

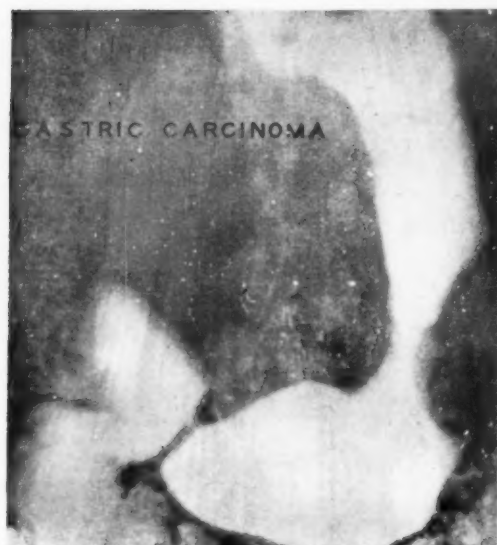


Fig. 4—Gastric carcinoma.



Fig. 5—Gastric carcinoma involving entire stomach.

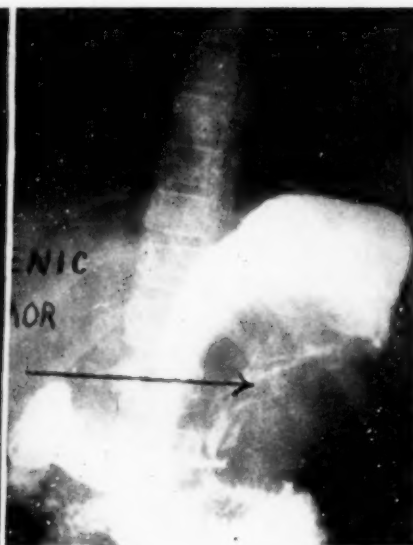


Fig. 6—Gastric deformity due to pressure of splenic tumor on greater curvature.

To recapitulate the figures of greatest incidence, we reveal the following:

- Appendiceal pathology....30%
- Gall-bladder pathology....15%
- Duodenal pathology.....15%
- Stomach pathology.....10%

Roentgen ray findings when competently analyzed and studied constitute today a very important adjunctive factor in gastro-intestinal diagnosis. One large clinic in this neighborhood has found its efficiency, proven by operation, to be over 95 per cent. The technique in making an x-ray examination for gastro-intestinal diagnosis I shall not burden you with, but simply outline briefly the diagnostic findings which are studied and observed in any good x-ray laboratory before a diagnosis is made.

NORMAL FINDINGS.

The normal stomach varies as to form, for instance, the tall slim person usually has a stomach which is long and acutely flexed at the distal

portion, and is usually referred to as "fish hook" type, whereas in the fleshy, stocky individual, the stomach lies high and is more transverse, and, according to its shape, is known as "steer horn" type, the former being far more frequent than the latter. The names are simply descriptive of the shape of these organs, and may reach from one extreme to the other. The anatomical landmarks which are routinely observed in gastro-intestinal work are:

1. The esophagus, its contour and peristalsis.
2. The stomach,
 - Pars Cardiac.
 - Pars Media.
 - Pars Pylorica.
 - Incisura Cardiac.
 - Incisura Angularis.
 - Gas Bubble.
 - Pylorus.
3. Duodenum, first, second and third portion.
4. Cecum and appendix.
5. Colon, immediately by injection

or at twenty-four hour periods following barium meal.

In the examination of the colon we note and observe the cecum, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid and rectum.

A normal stomach from an x-ray standpoint should present:

1. Motility, showing complete clearance of barium meal in six hours.
2. Form, usually fishhook type, occasionally steer-horn in stout individuals or some intermediate grade.
3. Orthotonic, that is, it assumes a vertical form, even under moderate distention.
4. Contour, showing sharp outlines with the presence of peristaltic waves, the presence of the incisura angularis and the incisura cardiac.
5. Size, normal, should hold without particular overdistention, from 20 to 24 fluid ounces.
6. Position, varies as the lower hor-



Fig. 7—Diverticulum of duodenum.



Fig. 8—Congenital pyloric atresia.



Fig. 9—Large gall stones.

- der may lie considerably above or below the navel.
7. Mobility should be present to palpation.
 8. Flexibility, that is, it should indent by the pressure of the finger.
 9. Peristalsis should always be present, and usually anywhere from one to three waves at one time,



Fig. 10—Pathological appendix, segmentation.

whereas more than this should be considered in the nature of hyperperistalsis.

ABNORMAL FINDINGS.

Carman classifies x-ray findings into two groups; namely *direct* and *indirect*. Direct, meaning filling defects, are pathognomonic. They show as extrusion, such as a niche or accessory pocket, or as intrusion of the lumen. The niche is seen in gastric ulcer, duodenal ulcer and diverticulitis of the colon, and the intrusion in tumor or malignancy. Indirect findings are known as follows:

1. Abnormal spasticity.
2. Altered peristalsis and motility, (presence of six hour residue).
3. Tone interference.
4. Abnormal mobility and flexibility.
5. Presence of localized tenderness.

In the absence of direct findings, the indirect are at times so pronounced that justifiable diagnosis can be made by them alone.

GASTRIC ULCER.

1. *Direct Findings:*
 - (a) Niche or barium filled crater of a penetrating ulcer.
 - (b) Accessory pocket, or so-called diverticulum. (The cavity of superficial ulcer).
 - (c) Organic hour-glass stomach.
2. *Indirect Findings:*
 - A. Spastic manifestations.

- (a) Incisura.
 - (b) Spastic hour-glass stomach.
 - (c) Diffuse gastric spasm.
- B. Retention from the six hour meal.
 - C. Abnormal peristalsis.
 - D. Gastric hypotonus.
 - E. Acute fishhook type stomach.



Fig. 11—Carcinoma of the sigmoid.

- F. Lessened mobility of stomach.
- G. Localized tenderness.

In the presence of hour-glass stomach or incisura, tincture of belladonna, 20 minims, t. i. d. is given until a dilated pupil with dryness of the throat results. This is given for the purpose of ruling out spasms, thus to determine whether or not the lesion is intrinsic or extrinsic.

GASTRIC CARCINOMA.

1. *Direct Findings:*
 - (a) Filling defects.
2. *Indirect Findings:*
 - A. Abnormality of pyloric function.
 - (a) Gaping of the pylorus.
 - (b) Obstruction of the pylorus.
3. *Abnormal Peristalsis.*
 - (a) Absence of peristaltic waves from involved areas.
 - (b) Weak peristalsis.
 - (c) Violent peristalsis.
 - (d) Anti-peristalsis.
 - (e) Irregular peristalsis.
4. *Abnormal Motility.*
 - (a) Rapid emptying (non-obstructive case).
 - (b) Delayed emptying (obstructive case).
5. *Lessened Flexibility.*
6. *Lessened Mobility.*
7. *Abnormal Size or Capacity.*
 - (a) Shrinking.
 - (b) Dilatation.

3. *Persistent Local Spasm.*
9. *Displacement.*

DUODENAL ULCER.

1. *Direct Findings:*
 - A. Deformity of the duodenal bulb.
 - B. Diverticulum.
2. *Indirect Findings:*
 - A. Gastric hyperperistalsis.
 - B. Gastric retention from the six-hour meal (the combination of hyperperistalsis with the retention and hypermotility is especially significant of duodenal ulcer.)
 - C. Hypermotility.
 - D. Gastric hypotonus in the non-obstructive form.
 - E. Gastric hypotonus with dilatation of the antrum and pouching, seen in old obstructive cases.
 - F. Gastric spasm, such as spastic hour-glass, or transient incisura.
 - G. Localized tenderness to pressure over the duodenum.

PATHOLOGICAL APPENDIX.

1. *Visibility* (Skinner states that the appendix normally is visualized up to the age of thirty and when noted past this age period it should be considered indicative of chronic disease).
 - A. Regularity or irregularity of lumen.

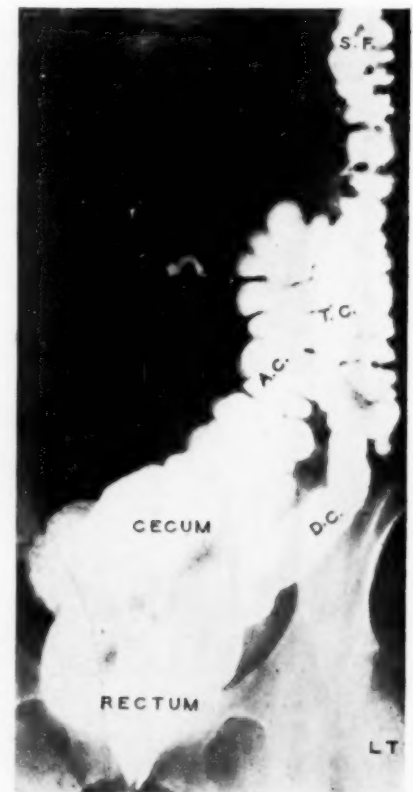


Fig. 12—Nonrotation of colon. Entire colon on left side.

- B. Movability or fixation.
- C. Presence of kinks.
- D. Tenderness to pressure.
- 2. Fixation and tenderness over the terminal ileum (Eastmond states that in the pathological appendix the terminal ileum is adherent and fails to hold barium evenly. Previous incidence of typhoidal infection must be ruled out.
- 3. Cecum.
 - A. Dilatation.
 - B. Fixed or freely movable.
 - C. Tenderness to pressure.
 - D. Relative ileal stasis (Alvarez states that the gradient or stimulated antiperistalsis of the terminal ileum in cecal pathology can produce ileal stasis).
 - E. Presence or absence of gastric residue in six hours.
 - F. Presence or absence of hypermotility.

PATHOLOGICAL GALL-BLADDER.

Direct Findings:

- A. Visualization of gall-bladder calculi.
- B. Visualization of gall-bladder shadow.

Indirect Findings:

- A. Indentation of stomach antrum.
- B. Fixation of stomach antrum to the right.
- C. Fixation of hepatic flexure of colon to stomach antrum.
- D. Six hour gastric residue.
- E. Hyperperistalsis.
- F. Hypermotility.

CONCLUSIONS.

- 1. Suspected gastric symptoms are generally primary in extragastric or abdominal pathology.
- 2. Roentgen ray findings, when properly obtained and estimated, are of great value in gastro-intestinal diagnosis.
- 3. Clinical history and laboratory findings should be associated with the roentgen examination whenever feasible.
- 4. X-ray findings divided into two groups, direct and indirect.
- 5. In the absence of direct findings, the indirect may at times be sufficient to establish a diagnosis.

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The Roentgen Ray and Its Use in Diagnosis, With Report of a Few Cases.*

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DISCOVERIES in mechanics and medicine during the profes-

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sional life of many of us have been marvelous; in mechanics the submarine, wireless telegraphy, the radiophone, the automobile, and aeroplane; in medicine, among others,

are the roentgen rays and radium. The latter have been found to be of such aid in the diagnosis and treatment of disease that many hundreds



Fig. 1.



Fig. 2-a.



Fig. 2-b.



Fig. 3-a.



Fig. 3-b.

of physicians are engaged in their use as a specialty. When the main principles of a science are discovered the progress along that line is usually rapid and unceasing as knowledge increases. From the old glass and mica plate static machine we passed through the use of several forms of coils until now machines

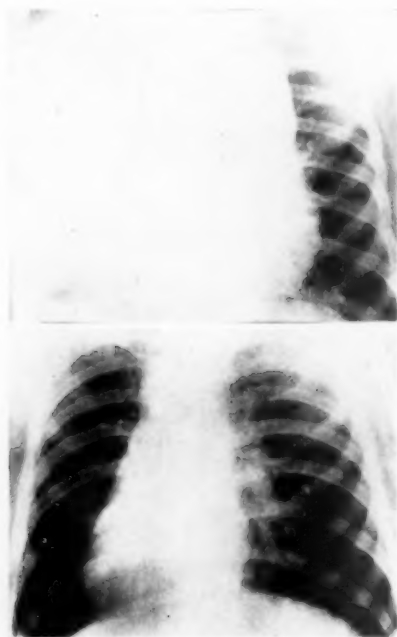


Fig. 4-a. Fig. 4-b.

and tubes as well as methods have become fairly well standardized. The methods and technique have become so perfected that the roentgenologist knows almost exactly what to expect and the roentgen ray has opened the windows for the observation of new truths to prove or disprove the correctness of old theories. The x-ray should be as much a part of routine examination in the diagnosis of diseases as is the examination of the urine.

It is an unfortunate fact that in too many instances the roentgen ray is only used when it is expected to be a positive factor in arriving at a diagnosis. The value of the negative x-ray findings is too much neglected and unappreciated. Furthermore, the routine use of the x-ray often treats one to gratifying surprises.

A few weeks ago I had a woman patient who complained of belching gas and of typical gall stone colic, followed by jaundice. She was forty years of age and fat. There were no genito-urinary symptoms and a microscopic examination of the urine revealed nothing of importance. The roentgen ray disclosed a shadow in the region of the left kidney, undoubtedly a renal stone. While I was unable to demonstrate gall stones

with the x-ray in this case, she surely has gall-bladder disease at least. She has since the first examination had hematuria and pyuria.

Diseases of the gall bladder are the result of infections, i. e., specific types of streptococci have been brought to the gall-bladder by the blood stream or lymphatics. Gall stones do not develop without previous inflammation of the gall-bladder. Undoubtedly a good deal of effort has been wasted by roentgenologists endeavoring to demonstrate gall stones. Of course, it can be done in a certain percentage of cases, but even if done correctly in 100 per cent—and it is correct in scarcely half that number—the method avails nothing in the group of patients suffering from cholecystitis without stones, strawberry gall bladder, papillary gall bladder, and early carcinoma cases. To depend on the roentgen ray in these cases, except in corroboration of the clinical diagnosis by the indication of the probable presence of stones would be a step backward in the clinical progress of medicine.

By its confirmative or negative evidence the x-ray adds much to one's diagnostic sense of security. When by means of the history and the usual clinical findings, one excludes an ulcer of the stomach in a neurotic patient who is sure she has an ulcer,

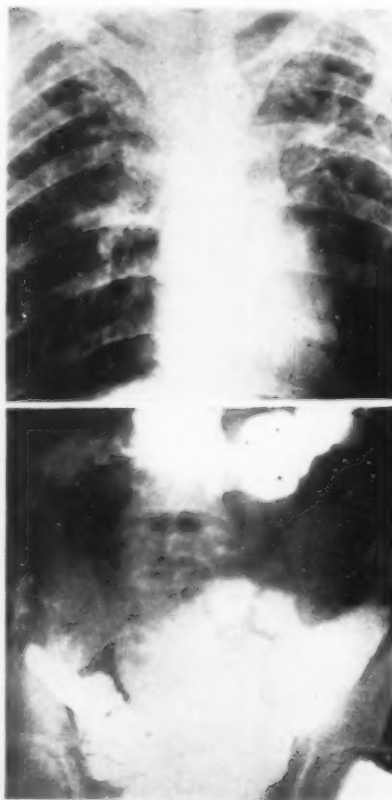


Fig. 5-a. Fig. 5-b.

the negative testimony of the x-ray adds to one's peace of mind.

With the roentgen picture came the danger of failure to properly interpret it. The roentgenogram may be accurate, but man is not infallible. Many operations, far too radical, such as amputation of limbs, have been advised in the belief that death from sarcoma would otherwise result, when as a matter of fact it was

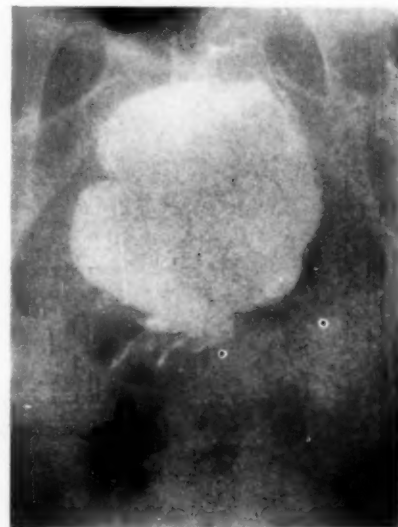


Fig. 6.

but bone cyst or cartilagenous tumor. The surgeon is frequently confronted by patients who have been hypnotized by the suggestions of physicians into believing that they have disease. These patients appear with a box of roentgenograms showing that their stomachs are low. Their physicians have recommended gastro-enterostomies or colectomies, although there is but slight if any delay in emptying time. Such individuals are usually women, though sometimes they are men, still worse subjects. They have weak muscles, are usually tall, narrow of girth and long of loin, and therefore it would be surprising to find that the longitudinal muscles of the colon were in proper tone; with but a few inches of lateral width in which to attach twenty-four inches of transverse colon, the latter naturally hangs lower. If stasis is present, these patients have been told that all their ills, mental and physical, will be relieved by elevating or shortening the colon, and the surgeon who refuses to operate is looked upon as an obstructionist. Goldthwait says it is a fortunate thing after operation to fix these posed organs that they do not stay fixed.

In conclusion, I wish to emphasize the fact that the roentgen method is an extremely valuable method, but

its greatest value lies in its use in conjunction with other methods.

Case 1: Mr. McC., age 34, was operated twelve times for osteomyelitis during his fourteenth and fifteenth years. He was then apparently well for nineteen years, when an abscess developed in one femur. X-ray examination revealed a Brodie's abscess which was confirmed by operation two and one-half years ago. Since the operation he seems entirely well.

Case 2: Frank S., age 14. Three years ago, while spending the summer in the mountains of Colorado, the patient noticed that his right ankle was sore and it was thought that he had had an injury. It was accordingly treated for ten days, then he was sent to Denver for x-ray examination and it was found that he had osteomyelitis of the right fibula, for which an operation was performed and about one-half the fibula removed. He apparently has no inconvenience from its removal.

Case 3: Mr. A. J., age 54, came in January, 1922, for relief of a tumor of the left foot. He stated that at the age of four years he had had infantile paralysis affecting this foot and that since his early teens the foot has been thick and swollen. The use of it has been limited ever since he can re-

member and he has always walked on his heel and been unable to bear much weight on his toes. Three months prior to this consultation the foot had become swollen and painful and within three weeks the swollen area burst open and within a few weeks more became about the size and appearance pictured in the illustration. X-ray examination revealed nearly complete destruction of the metatarsal bones and part of the astragalus. Dr. M. G. Wohl examined a specimen of this case and reported it to be a giant cell sarcoma containing spindle cells. So it is evident that this giant cell sarcoma of many years duration became malignant rather suddenly. Amputation was done at about the juncture of the lower and middle third of the lower leg. This was two years ago and the patient is now alive and well.

Case 4: Mr. A. M., Age 19, came in November, 1923, for relief of weakness and extreme dyspnea which had been gradually progressing for the past three months. Physical examination revealed tumor masses in the left neck, extending downward into the supraclavicular space. There was apparently no air going into the left lung and the x-ray showed complete choking of the left side of the chest. A specimen

was sent to Drs. Wohl and Warner and they reported it to be lymphosarcoma. Deep x-ray treatments, consisting of 300 milliamperes minutes, were given November 6th, and the second radiogram, taken one week later shows the wonderful improvement. Within thirty days every vestige of this growth was apparently gone.

Case 5: Mr. E. V. K., age 28, has had pulmonary tuberculosis for eight years. Seven weeks prior to this examination he developed abdominal pain which was increased by taking food. He had a diarrhea with four to six bowel evacuations daily. Tubercle bacilli were found in the sputum. X-ray examination showed a persistent filling defect in the ascending and transverse colon which is undoubtedly tuberculous colitis.

Case 6: Mr. R., age 52, came for relief of intestinal obstruction of eleven days' duration. Had noticed increasing difficulty in securing bowel movements for past four months, although he had taken large doses of epsom salts. Lost 25 pounds during the past four months. A barium enema presented a filling defect at the rectosigmoid juncture, which was diagnosed as carcinoma and proved at operation.

Suggestions for the Treatment of Pulmonary Tuberculosis by the Ultra-Violet Ray.*

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IN DISCUSSING the treatment of any condition, especially one in which a physical agent is employed, the question immediately comes up as to just what the agent is and what effect it has upon the tissues of the body. It is not my intention to discuss this phase of the subject in this article, and for those interested, I will refer them to the excellent articles by Pacini which are listed in the bibliography to this article.

During the past fourteen months I have treated some hundred cases of pulmonary tuberculosis using the ultraviolet ray and must truthfully say that there is no procedure that will apply in all cases. Some of these patients absorb huge quantities of the ray almost from the beginning, while

others burn quite readily and must be built up gradually. Brunettes, as a rule, have a greater tolerance for the ray than blondes. Our rule is to expose the patient about ten minutes, front and back, to the deep therapy lamp (Fig. 1) before turning on the ultraviolet ray. This dilates the capillaries of the skin, causes the patient to perspire profusely, and, we believe, places the skin in a more receptive condition to receive the ultraviolet treatment. In the summer, when the patient is very warm already, this part of the treatment may be omitted. After using the deep therapy lamp, we dry the skin by a somewhat vigorous rub with a turkish towel before using the ultraviolet. We believe this also helps by bringing still more blood to the surface.

In using the ultraviolet or actinic ray (Fig. 2), we begin by raying the

trunk and limbs at a thirty inch distance, giving one minute for blondes and two for brunettes the first day, and increasing a minute each day until we reach ten minutes. We then decrease the distance of the arc from the patient about two inches each day until we reach fifteen inches. Sampson contends that the treatment should be extended to thirty minutes or more, but, where it is necessary to handle a large number of patients each day, this is not practical. Furthermore, I have failed to secure better results from giving the long treatments. I have also read where it was considered an advantage to begin by raying, first the feet, then the legs below the knee, etc., gradually working over the entire body. I consider this technique impractical and without scientific foundation. It merely delays the results that one should hope to obtain. Whenever possible,

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these treatments should be given daily except in the presence of a marked skin reaction, when the treatments should be discontinued until the erythema subsides. Patients that are able to carry on their work, usually prefer to come about three times a week, and improve nicely when they come regularly. I have found from one to three months the average time necessary to arrest a case of pulmonary tuberculosis, depending upon the severity of the case.

Occasionally, I receive a communication from some physician who does not feel that he is obtaining the results that he should expect. And on inquiry, I usually find that he is either careless in his technique or neglectful of his patients. These machines are constructed for one purpose only and that is to produce ultraviolet energy, and, beneficial as

Patients with advanced tuberculosis often become sick and cough and expectorate freely during the treatments. They also emit a disagreeable odor which is diagnostic of the condition and quite pronounced when the patient perspires freely. This odor is kept down only by scrupulous cleanliness on the part of the patient. It is undoubtedly caused by the throwing off of the toxic material by the skin.

While I consider the ultraviolet lamp as nearly fool-proof as any modality that we employ in the laboratory, it requires more than merely turning it on for a few minutes and then turning it off to secure satisfactory results. Even where our instructions are explicit, I find that the improvement of the patient is influenced quite markedly by the training and experience of the technician

I consider it the most valuable contribution of late years, and hope to see it used universally within the near future.

I will report three cases of advanced pulmonary tuberculosis that were treated by the ultraviolet ray, in which the patients undoubtedly owe their lives to the use of this modality.

E. G.: Female, blonde, age 24 years. Development of fifteen year old girl. Very weak and anemic. Had undergone three unsuccessful operations for tuberculous fistulae during the past fifteen months. Examination revealed marked involvement of both apices. The old tuberculous abscess on her right hip was discharging pus through two fistulous openings and was causing her a great deal of pain. The white blood count was 15,000, red blood count 4,000,000 and hemoglobin 40 per cent. Her temperature ranged from 99 to 102 degrees Fahrenheit.

She was taken to the hospital, the tuberculous fistulae were incised, curetted, swabbed with pure carbolic acid and packed loosely with gauze. At the end of six weeks, patient left the hospital with the abscess and tuberculous fistulae apparently well, and was placed on the usual cod-liver oil, rest, and open air treatment prescribed for sufferers from tuberculosis. At the end of about three months she was back with another fistula that opened into the old scar. This was merely incised and swabbed with iodine. It soon healed. Seven months later, I was notified that she was not expected to live. She had been bedfast for six weeks and the trouble was not better. I had her treated symptomatically until she could be removed here. Examination showed advanced tuberculosis in both lungs. She was very emaciated, and was expectorating profusely with an occasional small hemorrhage. The old fistula had opened and was draining again. She looked like a hopeless case.

Ultraviolet treatments were begun, using the air-cooled lamp at a thirty inch distance. The treatments were given daily, beginning with one minute the first day and increasing the exposure a minute each day until she was receiving ten minutes, front and back, at each treatment. We then maintained this time of exposure and shortened the distance one or two inches each day until the burner stood about fifteen inches above the body. Like most of these "T. B." sufferers, she showed extreme tolerance for the ray, and, although she quickly became bronzed, she never



Fig. 1—General body raying—convective heat.

the ray has proved to be when used properly, it requires more than an inexperienced office girl to treat these patients and obtain satisfactory results. I am sorry to say that I have met a few physicians who think the only use of the machine is to extract a few dollars each day from some poor unfortunate, and turn the treatments over to the office girl with instructions to give the patients five or ten minutes under the actinic lamp and tell him to come back tomorrow for another treatment. I consider such a procedure criminal on the part of the physician. These patients should be examined daily, the proper medicines prescribed, the diet regulated, and minute instructions given relative to hours of rest, bathing, exercise, clothing, and everything that will tend to a successful issue.



Fig. 2—Medical diathermy treatment for pulmonary tuberculosis.

giving treatments. Frequently patients drive the eighteen miles that separate our laboratories, on days that I am at the one or the other, because they claim that they improve more rapidly when I give them my personal attention. I also notice that the old patients invariably request the services of the more experienced technicians. As stated above, it requires more than exposing the patients to the ultraviolet ray to obtain satisfactory results, and it is only where the physician studies his cases individually and checks the results carefully that the maximum of success will be acquired. (This same rule will apply to all other branches of medicine.) Ultraviolet energy is not a specific for tuberculosis, but is merely another asset to our armamentarium for carrying on the war against this dread disease. However,

became sunburned to the point of discomfort. (I explain this extreme tolerance of these patients to the ray, as being due to the roughened, dry condition of their skin. The patients that have soft, vascular skins are the ones that burn quickly). The ultraviolet treatments were preceded in each instance by radiating the body with the deep therapy lamp for twenty minutes over the chest and back. The distance of the lamp from the body was regulated according to the comfort of the patient, but the heat was made intensive enough to produce a flushing of the skin and a profuse perspiration. After four weeks of treatment, the patient ceased to have afternoon temperature, had gained in weight, and the appetite had improved. She continued the treatment for another thirty days, and then was sent home with instructions to return in four weeks for further treatment. On her return she was treated daily for a period of three weeks and then was dismissed, clinically well. Now, after six months she writes that she is in perfect health, has gained seventeen pounds since leaving the clinic here and is very grateful for all that we did for her. One point worth mentioning, is the fact that the tuberculous fistula healed rapidly during the ultraviolet treatments and has given her no more trouble.

The second case that I wish to report is almost parallel to the one just described. With this patient, however, the trouble was entirely pulmonary. When first presented for treatment, he was so sick that he had to be placed in the hospital for several weeks and treated symptomatically before he could be brought to the clinic for ultraviolet treatments. Briefly, his case presented the following points of interest:

W. D.:—Boy, aged 15 years. Tall, anemic, hollow chested. When presented for treatment he was running a temperature of 104 degrees Fahrenheit, was coughing constantly and expectorating huge quantities of thick creamy pus. He was too weak to stand and had to be placed in the hospital for several weeks before he could be brought to the clinic here for treatment. X-ray examination showed almost complete involvement of the right lung, with cavitation. There was also some involvement of the left upper. The patient was so toxic that we had difficulty in inducing him to take a little whisky and other stimulants in sufficient quantity to maintain life. Operation for drainage of the rotten lung was suggested and abandoned as a hopeless procedure.

His life was despaired of. At the end of two weeks, however, he began to take more nourishment, and we soon began bringing him to the clinic on warm days for ultraviolet treatments. Within less than a month he was able to make the trip himself, on the street car.

His temperature was now normal most of the time, and the expectoration was not nearly so profuse. He continued the treatments for six weeks longer, during which time he gained rapidly in weight and strength. His father then took him to Arizona in the hope that the dry climate would prove more healthful than the changeable climate of the Mississippi Valley. After four months he writes that the boy has continued to gain and is getting along nicely. Since going to Arizona, I have continued to instruct them

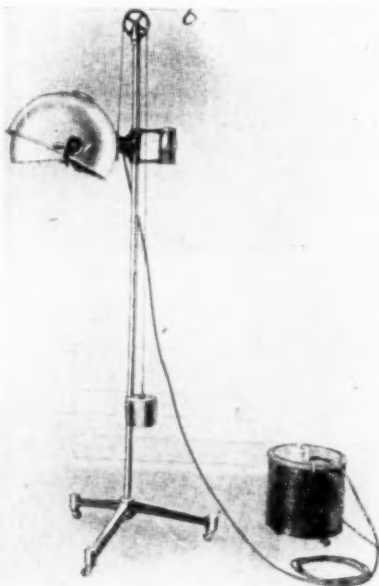


Fig. 3—Quartz lamp, alternating current type.

relative to sunshine, diet, rest and general hygienic measures.

The third case is of interest because it illustrates how other physical agents may be used in conjunction with the ultraviolet ray under certain conditions. This case was also checked up by frequent x-ray examinations of the lungs.

Prints of plates taken before, during, and at the end of the course of treatments are reproduced in this article (Figs. 4, 5 & 6).

Mrs. A. C. C.: Age 38 years. Blonde, weight 110 lbs. Family History: Two sisters had died from tuberculosis. Patient had one daughter that was afflicted with tuberculosis of the spine.

Past History: Asthma for twenty years. Pneumonia three times. Oper-

ation for appendicitis eight years ago.

Present Illness: Shortness of breath for past six months. Most pronounced after exercise. Rise of temperature almost every evening, and morning expectoration. Occasional headaches. Positive Physical Findings: Some redness and tenderness about throat, voice slightly husky. Slight dullness with finely crepitant rales in both uppers, most pronounced on left side. Liver dullness higher than normal. Temperature 99 degrees F. Pulse 98 sitting. Respiration 30. Red blood count 4,000,000. White blood count, 9,800. Hemoglobin, 70 per cent. Wassermann negative. Sputum positive for tuberculosis on fifth examination.

The case was diagnosed pulmonary tuberculosis and the patient was advised to take ultraviolet x-ray treatments. She refused but asked to take her plates (Fig. 4) to her family physician for his opinion. This was granted. She did not return until September 15th, nearly five weeks later, and excused herself by saying that her family physician had told her that these treatments were all bunk, that we simply burned patients alive and took their money for nothing. He had given her a month's treatment for "stomach trouble" but she had not been benefited by his treatment and having met some one who had been treated by us for pulmonary tuberculosis, she decided to return and take a few treatments. We began by raying her body daily as outlined above, giving her at the same time a preparation containing seven and one-half grains of sodium iodide to the teaspoonful three times daily.

At the end of two weeks she was no longer bothered with the asthma and we discontinued the medicine. After three weeks of daily raying with the air cooled lamp, we changed the treatments to every other day, adding an ionizing dose of x-ray over the entire chest each week in order to break down fibrous tissue and hasten absorption. On the period following the x-ray treatment she was given, in addition to the ultraviolet treatment, diathermia treatment (Fig. 3), using six inch mesh electrodes and placing the anterior electrode over the left upper for ten minutes and below the right breast for twenty minutes. The current was advanced to from 800 to 1,000 milliamperes according to the comfort of the patient. The heart's action was slightly accelerated by these treatments, but the patient suffered no other ill effects. This was done to increase the blood supply to the

affected portions of the lungs and hasten the absorption of cellular debris. There was evidence of an old empyema in the right lower base, and the patient stated that she had had a "rising" in her side at one time.

After about six weeks of treatment, the patient ceased to have afternoon temperatures. The expectoration, which increased at first, had about ceased and no longer contained bacilli. She continued the treatments through the second month, and then decided to discontinue them for a while. She now weighed 122 lbs. and was doing her own work. An x-ray of her chest (Fig. 5) showed wonderful improvement. After being out four weeks, she dropped in again and resumed the ultraviolet treatments, again taking three each week. She continued to gain and no longer comes for treatment, although she drops in occasionally for observation. Her chest plate was quite clear and is reproduced in Figure 6.

Sputum examinations of each of the above patients showed tubercle bacilli in abundance at the time of their entrance to the clinic. These decreased rapidly under the ultraviolet treatment.

I mention these cases simply because they illustrate what can be accomplished by the careful and persistent use of the ultraviolet ray. These cases were considered hopeless by their attending physicians, and

with the usual symptomatic treatment, would doubtless have died.

SUMMARY.

1. The actinic or ultraviolet ray is not a specific for pulmonary tuberculosis, but is perhaps the most valuable contribution to the treatment of this dread disease that has been produced in recent years.

2. To treat this condition successfully, the physician must study each case separately, prescribe proper drugs, regulate the diet, assign certain hours for rest, instruct regarding exercise and general hygiene, and leave nothing undone that will help restore the patient to health.

3. The treatment should not be given by an inexperienced technician, but by one that is trained in the use of the apparatus, in hygiene, and in the care of the sick.

4. When carefully and scientifically treated, as outlined above, we may confidently expect a clinical cure in advanced cases of pulmonary tuberculosis.

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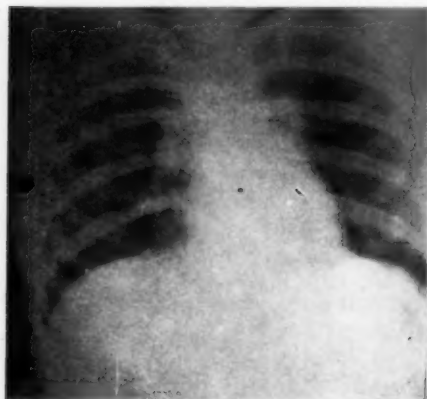


Fig. 4—Case III before treatment.



Fig. 5—Case III after eight weeks of ultraviolet and x-ray treatment.

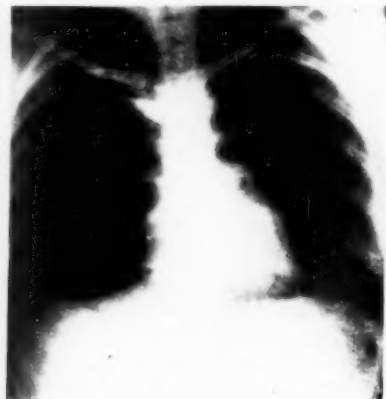


Fig. 6—Case III after four months treatment. Patient clinically well.

A New Device for Charging Electroscopes and Iontoquantimeters.*

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Reviewed by Alfred W. Simon.

A NUMBER of devices used in physical measurements have to be charged to potentials ranging from 1,000 to 4,000 volts. To this class belong in particular those electroscopes and electrometers which, in conjunction with ionization chambers, are used to measure x-ray intensities. Every instrument of this type has a certain capacity for electricity; the quantity of electricity which is required to raise it to a definite voltage above ground being given by the product CmV , where Cm is the electrical capacity of the instrument and V the voltage to which it is raised above ground. In most cases this charging is effected by means of a rubbed ebonite or glass rod. However, this method has the disadvantages that it depends to a great extent on the humidity of the air, and that it is difficult to charge the electroscopes up to a definite scale division.

To obviate these difficulties, the author has developed a new device based on the following principle:

If a condenser of capacity of C is charged from a source of direct current (battery or line voltage), to a potential v , the quantity of electricity Q stored in the condenser is given by:

$$Q = Cv$$

If the source is then disconnected and the capacity of the condenser is decreased to a value c , we again have:

$$Q = cV$$

Since the charge on the condenser is the same in both cases, we must have:

$$Cv = cV$$

that is to say, the potential must rise to a value of v given by:

$$V = \frac{C}{c} v$$

In practice this principle is applied as follows:

Two metallic plates with a thin sheet of dielectric in between are pressed tightly together, thus forming

a parallel plate condenser of relatively large capacity. This condenser is charged to a potential of, say, 110 volts by connecting one plate to a source of direct current and grounding the other. The charging line is then disconnected and the plates separated to a distance of about 10 mm. This decreases the capacity to a small fraction of the original value, and increases the voltage in the same proportion.

Hence, if an electroscope is to be charged to a potential of 2200 volts, a source of 110 volts being used to charge the condenser, the charging device must be so dimensioned that

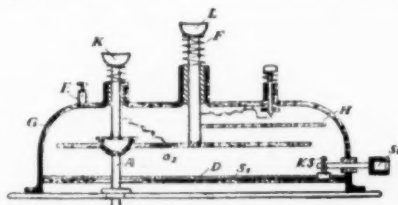


Fig. 1.



Fig. 2.

on separating the plates the capacity decreases to 1/20 of its original value.

Obviously, the advantage of this instrument lies in the fact that the charging is done from a source of direct current and is therefore independent of the humidity of the air, ionization of the air, etc.

Figure 1 is a diagram of the instrument. A metallic housing G closed at the bottom by a metallic plate S_1 is grounded by means of the binding post E . A second metallic plate S_2 can be lowered and pressed against the dielectric D , by depressing the key L . When the plate is in this position, the arm H touches the contact KS and charges the condenser from the line, which is connected to KS through the binding post St . When the key L is released, the contact between H and KS is broken, and the plate S_2 , actuated by the spring F , moves away from S_1 ; the potential difference between the plates now increases to some twenty times its original value. In order to obtain any desired intermediate potential, for example, to charge an ontoquantimeter up to a definite scale reading, it is only necessary to lower the plate S_2 a little by slightly depressing L . The connection to the electroscope is made by means of a second key K , which operates in a way easily seen from the figure.

If a system of small capacity is to be charged, one proceeds as follows:

The key K connecting the electroscope to the charging device is first depressed; then the operating key L is depressed, which lowers the plate S_2 and, when S_2 is at its lowest position, connects it to the source of potential through KS and St . If the key L is now allowed to rise slowly, the voltage of the electroscope will rise gradually. When the leaf (or indicator) of the electroscope is at the desired scale division, K is released, disconnecting the electroscope from the charging device, and leaving the electroscope charged. For convenience, L is provided with an adjustable stop Ei , which can be set

*From an article appearing in *Strahlentherapie* Vol. 16, 1923.

so that any desired reading (deflection) can be repeated without the help of the key *K*.

If a system of large capacity, an iontoquantimeter with cable and chamber, for example, is to be charged, the operation must be repeated a number of times. Once the stop *Ei* has been set at the desired point, the key *L* can be worked rapidly up and down a number of times until the voltage of the iontoquantimeter has been raised to the desired value.

If only alternating current is available, a rectifier must be used. A very convenient rectifier for this

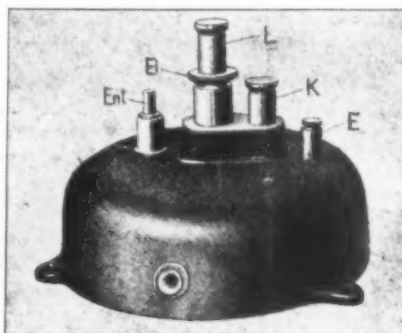


Fig. 3.

purpose can be constructed from an ordinary incandescent lamp by sealing in an anode as illustrated in Figure 2. Under these conditions the condenser is charged up to the peak voltage of the alternating current line, that is to say, if the line voltage is 120 volts, the condenser is charged up to a potential of 170 volts.

Besides the two keys already mentioned, another small key, *Ent* in Figure 3, is provided, which is used to discharge the electroscope. In order to do this, it is only necessary to depress both the key *K* and *Ent* simultaneously.

Causes of Failure With Autocondensation in Hypertension.*

B. L. KNIGHT, M. D.,

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THE treatment of high blood pressure is a subject that is of interest to every physician, whether country practitioner or specialist, for the effects may manifest themselves in any portion of the body. Any treatment of this condition that produces results in a few cases is readily put in the medical literature, but the failures, so frequent in the hands of all of us, are never mentioned. Like others, I have had a few cases where autocondensation produced excellent results yet the same treatment in others proved useless or harmful. In an effort to find out why this should be, I decided to make a closer study of the cases which are classified as failures.

In order that we clearly understand each other it will be necessary to define the words used in the title. The "causes" of failure may be either sins of omission or commission on the part of physicians, or may be due to the patient failing to carry out instructions. The latter is often out of our control, but the doctor who simply finds out his patient has high blood pressure, and uses this fact alone as the basis of treatment, is bound to fail, no matter what form of treatment he may use.

"Failure" as used here applies to the situation when one is unable to reduce the pathological pressure half way to the upper limits of normal,—age, sex, etc., being duly considered. Thus a male patient fifty years of age should have a normal systolic pressure of 150 mm. If found to

be 250 mm., a reduction to 200 mm. would be satisfactory. If not reduced this amount the case is classified a failure. In like manner an original of 300 mm. pressure should be reduced to 225 mm. In case of a systolic of 170 a reduction of 20 mm. might be classified a success while the reduction of 20 mm. with an original of 250 mm. would be a failure.

"Auto-condensation" is the use of the bipolar high frequency apparatus, using the condenser couch. For the majority of cases the hand electrode is used. The milliampere reading varies from 300 to 2,000. Many users say that the current should be cut down when the wrists begin to ache, but just why the size of the wrists should determine the upper level of safety in blood pressure cases, no one has explained. True, with the hand electrode only about 800 ma. can be given for any length of time, but when you deem heavier dosage to be an advantage you can use a larger plate in place of the hand electrode, placing it either on the abdomen or under the soles of the feet, and then a current of 1,500 to 2,000 ma. can be used without any discomfort to the patient. This high current should only be used in selected cases to be discussed later.

Another point, which a great many advocate, is to stop the treatment when the patient begins to sweat. If the main idea in the treatment is to increase the body temperature it seems to me that little attention should be paid to this point, especially during the summer months. The majority of the cases benefited have

been the cases that have perspired freely.

Just how autocondensation acts in these cases it is difficult to say. It seems that the heat produced is the all important point. It may be compared to bread making, where no matter how good the ingredients, unless a proper temperature is maintained, the bread does not rise. Likewise in the body a certain temperature is necessary for proper metabolism, and the cases benefited by autocondensation are always those with a subnormal temperature, often as low as 96 F. in the morning. Increasing the body temperature by any means is a very important part of the treatment of these blood pressure cases.

As proof that autocondensation does increase the metabolism, one need but examine the patient's urine both before and after treatment. The cases benefited usually have a low specific gravity before treatment. This will change from around 1.010 to 1.020 or above, without any change in the liquid intake. In cases where this increase is not found, this form of treatment is practically useless, as it means a kidney with a fixed solid output per 1000 c. c. that cannot be increased no matter how much the body metabolism is increased. In these cases the total solids passed in twenty-four hours can only be increased by forcing the amount of liquids taken. Cases with a high specific gravity (and without sugar) before treatment, do not respond as well. As a prognostic point the specific gravity before and after treatment is worth watching.

*Read at Des Moines, Iowa, February 27, 1924.

By hypertension is meant an increase in the systolic blood pressure above the so called normal. To discuss the value of the diastolic pressure in these cases would require a paper by itself. While very important this phase will be left for future discussion. A question still unanswered is rather why the hypertension cases with a high pulse pressure respond more readily than the high blood pressure cases with a low pulse pressure.

Should hypertension be considered a symptom or is it a disease entity? A few writers consider it the latter, but the majority agree that high or low blood pressure is only a symptom and should be taken as an essential part in the diagnosis of any disease. When one finds a patient with high blood pressure, one is just as far from a real diagnosis as the man who, using only a thermometer, finds a fever, and then prescribes some fever tablets highly recommended by salesmen for the reduction of fever, without endeavoring to find out whether that fever is due to an otitis media, typhoid, appendicitis or a hundred other conditions. A complete history in hypertension cases is just as necessary as in fever cases. The first symptoms noticed, the sudden or gradual increase, age, sex, occupation, etc., all have a definite bearing on the treatment indicated.

After taking a complete history, and making a complete physical examination, including the Wassermann test in the routine, the cases are classified in one of the three groups given below, each having a different method of treatment.

I. ARTERIOSCLEROSIS.

In this group of cases the patient is usually above fifty years of age, and has had a gradual onset of symptoms, or the condition may be found on routine examination. These patients usually have known of the condition for years, going from one doctor to another with little benefit, often they have a history of apoplexy. The extremities are cold and the condition is more often found in the slender type than in the obese. The arterial walls are full of mineral

deposits and palpation along the pipestem arteries gives the diagnosis. In early cases the urine may be normal.

Our duty to this group is first to eliminate as far as possible all sources of irritation to the kidneys. This means the removal of all foci of infection, a strict salt free diet, and in this connection one can allow meat that has been put on in cold water and slowly brought to a boil, but the soup with the meat extractives should be forbidden. The nitrites should not be used except in urgent cases as after a hemorrhage. Often small doses of thyroid daily are a distinct aid. If autocondensation is used following a stroke, no more than 300 ma. for ten minutes should be used on first treatment which is gradually increased on each succeeding treatment at intervals of two days. Always stop treatment when the patient complains of a queer feeling in the head. The value of this treatment is marked in early cases but in the more advanced a reduction of twenty points is an excellent result. The value does not lie in the reduction but rather as a preventive measure to keep the patient below the danger point of another stroke, hence treatments far apart but at regular intervals should be given.

II. TOXIC.

In this group one should place all cases that have any form of kidney trouble. This may follow an acute illness or may be the result of some poisonous substance as nicotine, lead, arsenic, etc. Here again if the nephritis is secondary to infection elsewhere in the body, the primary foci must be removed if possible. The additional treatment of these cases may be summarized in one phrase, "give rest to the kidneys." This should include bed rest, restricted diet and active catharsis, forcing water only when a saline purge is used. Since autocondensation increases the work of the kidneys it is definitely contraindicated. If desired the application of diathermy to the kidneys may be used to increase the blood supply. It is in this group of cases that we have the most failures,

yet they often are the youngest in years of all the hypertension cases. Failure is due to the fact we do not give rest to the kidneys.

III. HYPERPIESIA CASES.

This term is applied by Doctor Grover to the group of cases with high blood pressure in which after careful study no other pathology can be found. A few of these cases are purely neurotic and should be so treated. The majority, however, are cases that have lost the kidney reserve power, and this is the forerunner of trouble in the near future. As yet the kidney is able to carry on its work, and, as one would expect, it is this group that responds so well to autocondensation. It is this group that you find written up in the medical journals with wonderful results recorded. You should select one of this group for your first trial of autocondensation for here you can use the plate method and use as high as 2,000 ma., giving daily treatments, and produce rapid results, for the kidneys in these cases are still able to pass off the products from the increased metabolism.

In conclusion let me again stress the fact that high blood pressure is but a symptom, and no matter what line of treatment one may elect to follow, or how successful that treatment may be in some cases, in others one is doomed to failure unless the patient changes his mode of living and thus removes the original cause of the trouble. This may require dietary measures, exercise, removal of infection or elimination of some poison, often it requires a change of employment. Should you employ autocondensation as an aid in the primary reduction impress upon the patient that the permanency depends entirely upon him. When using this aid, by carefully watching the specific gravity of the urine (before and after treatment), one can early receive information as to whether this form of treatment will be of value in the particular case. If properly used, in selected cases, it is a very valuable aid, but in no sense can it be called a universal cure for all types of high blood pressure.

EDITORIAL

The JOURNAL OF RADIOLOGY

A Journal of Ideas and Ideals.

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A. F. TYLER, M. D.,
Managing Editor

ANNUAL MEETING

**American College of Radiology
and Physiotherapy
Chicago**

**November 10, 11, 12, 13, 14.
Hotel Sherman**

Program—Annual Meeting.

Already the program for the annual meeting of the American College of Radiology and Physiotherapy is nearing completion. Men of prominence in the various phases of physical therapy and x-ray diagnosis have already sent in titles for their papers. Five days will be occupied by the program, two forenoons of which will be devoted to clinics in hospitals where efficient x-ray and physical therapy departments are maintained. Men who are teaching the various subjects in the universities will also appear on the program. Of course there will be a banquet to which all are invited. It is hoped to make this event a real recreation and an opportunity to get acquainted.

The commercial exhibit will be one of unusual interest. The makers and distributors of all types of apparatus will be present and will gladly give demonstrations. Already many applications for space have been received.

Judging from experience in previous meetings, indications point to an attendance of at least one thousand.

In order that arrangements may be made with the least possible tendency to "last minute rush and hurry," it is urged that all who are desirous of reading a paper send in titles at once.

It would be well for dealers and manufacturers to make application for exhibit space. Space will be allotted

in the order applications are received.

Address all communications to

R. W. Fouts, Secretary,
121 S. 33rd St.
Omaha, Nebraska.

U. S. Civil Service Examinations for Physiotherapy Aides and Physiotherapy Pupil Aides.

The United States Civil Service Commission announces two open competitive examinations to be held throughout the country on August 6 and September 17. They are to fill vacancies in the Public Health Service and in the Veterans' Bureau throughout the United States.

The entrance salaries for physiotherapy aides in the Public Health Service range from \$960 to \$1,200 per year; physiotherapy pupil aides are not required in this service. In addition to these salaries appointees will be allowed quarters, subsistence and laundry.

The entrance salaries for physiotherapy aides in the Veterans' Bureau range from \$1,600 to \$2,500 per year, the salaries for physiotherapy pupil aides in this service range from \$1,000 to \$1,400 per year.

The duties of physiotherapy aides consist of administering physiotherapy in its several branches—massage, electrotherapy, hydrotherapy, mechanotherapy, thermotherapy; active, passive, resistive and assistive exercises and remedial gymnastics; keeping a daily record of the work and progress of each and every patient coming under direction and treatment; making the required reports of the activities of the reconstruction work in physiotherapy.

The duties of physiotherapy pupil aides are the same as those for physiotherapy aides, except that they are pupils under the supervision and instruction of the chief aide in all the work above mentioned.

Competitors will be rated on a mental test, practical questions, education, training and experience.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of United States Civil Service Examiners at the post office or custom house in any city.

Meeting of the Catholic Hospital Association.

The ninth annual meeting of the Catholic Hospital Association of the United States and Canada was held at Spring Bank, Okankee, Wisconsin, June 21 to July 27. This time was divided into three sections, the first for Sisters. This section divided into First Retreat for Sisters, June 21 to June 29. First week of conference was from June 30 to July 5, inclusive; second week of conferences July 7 to July 12, inclusive, and Second Retreat for Sisters July 12 to July 20.

For Nurses—June 21 to 28 was followed by retreat of two and one-half days and a vacation period of one or two weeks.

For Doctors—Conference July 21 to 23; retreat July 24 to 26; vacation period of a week or ten days.

The theme running through the entire period was "The Soul of the Hospital." This theme was one to conjure

with and allowed the presentation of all phases of hospital administration. Among the various subjects discussed was a "Report of the Committee on X-ray Technicians" by Sister M. Liberia, St. Joseph's Creighton Memorial Hospital, Omaha, Nebraska. In this report Sister M. Liberia told of the work done by the committee during the past year, the aim of which was to promote more uniform methods of work in the x-ray departments of the various Catholic Hospitals. During the year a questionnaire had been sent out to all Catholic Hospitals, the replies to this questionnaire furnishing inferent x-ray departments. When these questionnaires had been tabulated, inferences were drawn and suggestions made for improvement.

This is a step in the right direction and one which is much needed not only in Catholic Hospitals but in all hospitals throughout the United States.

Several years ago a committee, Dr. P. M. Hickey, University of Michigan, Chairman, was appointed by the American Roentgen Ray Society whose purpose was the standardization of x-ray reports in hospitals. It is our understanding that this committee is still working on the problem. It occurs to us that cooperation between this committee and the technicians' committee of the Catholic Hospital Association might be possible and profitable. Now that x-ray technique has become more or less routine it would appear that standardization of technique and reports is not only possible but desirable, formation as to the various methods in vogue in the dif-

Texas Radiological Society.

This society held its eleventh annual meeting in San Antonio, April 28th, and the largest attendance in the history of the society is reported.

The following officers were elected for the following year:

President.....Dalton Richardson, M. D., Austin.
President-Elect.....C. L. Martin, M. D., Dallas.
First Vice-Pres.....Davis Spangler, M. D., Dallas.
Second Vice-Pres....E. D. Crutchfield, M. D., Galveston.
Secretary.....Thomas Bond, M. D., Fort Worth.

Executive Committee:

R. T. Wilson, M. D., Temple.
I. L. McGlasson, M. D., San Antonio.
L. W. Kuser, M. D., Gainesville.

The Review of Clinical Stomatology.

This is the title of a little journal issued as a supplement to the Journal of Ophthalmology, Otolaryngology and Laryngology. It is edited by Alfred Asgis, D. D. S., of New York City, and by George W. MacKenzie, M. D., of Philadelphia. Associate editors are Wm. G. Schemmley, M. D., and Walter B. Veazie, Ph. D. It is published monthly at 640 Madison Ave., New York City.

Clinical Stomatology is devoted to the scientific interpretation of clinical facts and experimental evidence regarding diseases of the mouth and teeth and seeks to emphasize the need of an extensive popular educational campaign to pave the way for preventive dentistry. It has received many favorable comments from the medical and dental press since its initial appearance in December last.

Medical Journals.

Dr. W. J. Mayo, writing in the April number of *Surgery, Gynecology and Obstetrics*, has the following to say: "Every practitioner of medicine should charge himself with the obligation of devoting at least an hour a day

to their study, and should pay the debt. If for any reason he misses a day or two he should make up the time, but if on any day he is able to read for a number of hours he should credit himself with only the single hour. The man who will follow this course will, almost unconsciously, become well informed in medical matters, and if he has the power to apply and correlate this knowledge with his own experience he will become a leading member of the medical profession. Many men in speaking of an original conception of a disease, an original method of treatment, or an original operation, have informed me that the idea came to them in an attempt to correlate their own experience with that reported by writers of articles in medical journals."

An hour a day is all that many men can find for professional reading but it is little time indeed when one considers the wealth of information and suggestions lying at hand. One is often surprised at the lack of information in quarters where something quite different is expected; such a thing could not be were every medical man the student he ought to continue to be. What excuse is there for example, for the delay in and mistreatment of cancer cases reporting early to the family physician? He can sit down and consult with leading authorities every day if he wishes, and not only will he learn his own limitations but he will be better able to judge whom he should recommend to his patient if he cannot handle the case himself.

Baffling though a problem may be and unavoidable as many mistakes are, an hour a day of professional reading will render many a problem easy and avoid many a mistake. Once a red-blooded medical man forms the habit of professional reading nothing can make him neglect it short of physical disability or some unusual stress of circumstances.

History of Medical Practice in Illinois.

The attention of all former Illinois doctors especially is asked to the following announcement which has been received from Dr. Charles J. Whalen, who is acting for the Illinois State Medical Society which has under way *A History of Medical Practice in the State of Illinois*.

Any or all doctors, who have formerly been residents of Illinois, or any descendants of pioneer physicians of the "Illinois country" are asked to communicate at once with the Committee on Medical History, Illinois State Medical Society, 6244 North Campbell Ave., Chicago. The manuscript of this work must go to the printer at an early date and in order that the volume may be accurate and complete all possible assistance is asked from every source as to personal data and experience, including diaries, photographs and similar documentary mementoes of pioneer doctors and of progressive phases of medical practice, as well as records of the achievements of these men outside of the medical field.

The scope of the volume will range from the discovery of Illinois to modern times. Throughout this period of over 250 years there is much of thrilling interest to be detailed. Collection of the human interest data can come only from the families or closest friends of these pioneers, many of whom long ago removed to distant parts of the United States. Some of the subjects touched will be: Theories of healing from the days of the aborigines through the mound builders; primitive surgery; French and English explorers; physicians accompanying early explorers; ante-boundary days; sporadic settlers; medical attendants for the covered wagon; government surgeons and physicians, and physicians in attendance at the forts; herb doctors; medicine and missionaries; migration of pioneer physicians in new territory; the cir-

cuit-riding and saddle-bag doctors, their burdens, triumph and perils; pioneers as "utility citizens;" Illinois men in wartime; Illinois medical men in industry, science, belles-lettres, music and art.

Photographs and copies of letters and the like are especially desired. Prompt return in good condition is promised of anything loaned the Committee, the personnel of which is:

O. B. Will, M. D., Peoria.
C. B. Johnson, M. D., Champaign.
Carl E. Black, M. D., Jacksonville.
George A. Discus, M. D., Streator.
James H. Hutton, M. D., Chicago.
Chas. J. Whalen, M. D., Chicago, Chairman of Committee.

ABSTRACTS and REVIEWS

The Promised Cure for Cancer.
Editorial Boston M. & S. J. 190:
763, May 1, 1924.

IN this editorial the writer comments upon the announcement in the daily papers to the effect that Dr. Fischera of Padua promises a probable cure of cancer by the use of sera, also he comments upon an announcement in *American Medicine* for March, 1924.

Past experience, says the author, leads to conservative skepticism regarding claims of this nature, although the cure will doubtless be found. Very few revolutionary scientific theories heralded in the newspapers have ever stood the test of scientific investigation.

The point of the editorial is contained in the following quotation: "We hope that we are on the verge of great discoveries but we still feel that publication of reports of prevention or cure should be postponed until authorities other than the claimant shall have verified the findings. It is not only cruel to raise false hopes but unproved claims may lead to so many importunate requests from sufferers that even scientific investigations may be hampered. We cannot blame the newspapers for the publication of impressive news items. . . . but the ambition for publicity should be tempered with regard for scientific accuracy."

The Story of the X-Ray. LESTER J. WILLIAMS, M. D., New Orleans M. & S. J. 76:490-492, May, 1924.

THIS is a compact and comprehensive sketch, interestingly written, giving the history of the x-ray and its various uses today. Its commercial as well as medical uses are included. Metal castings are far more efficiently tested by the x-ray than by any of the older methods. During the war the x-ray served to

detect concealed armament, etc., shipment of which was sometimes attempted in bales of goods.

Radiodermatitis and Its Treatment.
ARTHUR U. DESJARDINS, M. D., and
FRED L. SMITH, M. D., Surg. Clin.
N. A. 4:479-493, May, 1924.

A first degree reaction is manifested by an erythema appearing ten to twenty days after exposure. There is a hot burning sensation accompanying the erythema but after three or four days the symptoms subside and the erythema gives away to a tan, although desquamation may result in some cases.

In a second degree the irritation is more intense and is followed by a period of exfoliation lasting from one to three weeks. There is a burning, raw sensation, particularly marked at the stage when the vesicles break. After this the raw surface gradually dries and a new layer of skin appears. Atrophy results and telangiectasis may appear within from one to three years.

Third degree burns result from gross errors of technique. Extreme irritation results almost immediately and is followed by intense erythema and vesiculation which in turn may be followed by ulceration which may be either slight or so severe as to involve the underlying tissues. The lesion gradually passes into a chronic state characterized by pain, a dirty gray or greenish gray "paper mache" coating, and with little or no tendency to repair. The pain is intense, sleep is interfered with and the patient's general condition greatly impaired.

Contrary to what one might think, there is more danger of an x-ray dermatitis resulting from diagnostic procedure than from therapeutic procedure. This is due to the fact that the operator in his zeal or his inex-

perience may lose sight of the total exposure time. Another danger lies in use of such topical ointments as contain iodine, scarlet red, mercury, pyrogalllic acid, cantharides, resorcin, betanaphthol tar, iodoform, sulphur and salicylic acid. The authors believe that most cases of idiosyncrasy are only so-called and that the explanation can usually be found in errors of technique or in the use of dangerous ointments.

A radiodermatitis of the first degree hardly calls for treatment but if the irritation is too troublesome a soothing lotion such as Dodd's (Phenol, 1.85 gm.; zinc oxid 15.5 gm.; glycerin 4 gm.; lime water q. s. ad 250 gm.) may be used. It should be thoroughly shaken and poured over a piece of absorbent cotton to the point of saturation, then dabbed over the area and allowed to dry, after which a second application is made and is allowed to dry before the clothing comes in contact with the skin. This procedure is carried out night and morning for two weeks and may be used for a week or ten days longer if necessary. Borozin, zinc stearate, calamin lotion, aluminum acetate in eight per cent stock solution and diluted 1:16 may be found useful.

The same treatment is found applicable in second degree reactions unless they border on third degree reaction less ulceration. In such a case ambrine or paraffin dressings may be found useful.

The treatment for third degree reactions is much the same in the acute stage as it is for second degree reactions. In the chronic stage, however, no halfway measures should be thought of, although the treatment used depends upon the site of the lesion and the character of the adjoining tissue (looseness, thickness, blood supply). If the area can be

excised and healthy tissue brought into approximation, then primary union and speedy convalescence may be looked for. Sliding flaps or grafts may be used under favorable conditions. Hyclorite dressings are beneficial in cleansing the wound and seem to stimulate the epithelium, or at least they do not hinder its growth. Hyclorite is preferable to Dakin's solution but it should be made up with cold water and not allowed to come into conjunction with sunlight as hydrochloric acid then forms.

Sunlight in conjunction with wet dressings is beneficial but it should never come through glass and it should be administered in progressive, graduated doses beginning with three minutes and gradually working up to half an hour. The quartz lamp is a useful substitute.

Paraffin dressings permit the patient to go about his work and if the surface is free from bacterial products the epithelium will grow luxuriantly under the dressing, which must be changed every twenty-four hours. The film of whitish exudate calls for the use of wet hyclorite dressings as indicated. The film will then disappear within two or three days and the paraffin dressings may then be resumed.

The Value of Radiology in Pyogenic Infections of the Skin. A. ROBERT TAFT, M. D., Urologic and Cutaneous Rev. 28:290-291, May, 1924.

SYCCOSIS, acne vulgaris, furunculosis and paronychia are named as conditions amenable to x-ray and radium therapy. In ordinary infections the effect probably comes through stimulation of the normal cells.

Septic wounds with chronic purulent discharge are responsive to treatment. (Knox). Diseased tonsils and chronic sinusitis are helped (Witherbee). Garrettson finds that he has good results in pyorrhea, Hickey in diphtheria carriers, Bowditch and Leonard in pertussis.

Carbuncle, in the author's hands, has yielded to x-ray treatment in ten cases which he reports here. He uses an infiltrated suberythema dose but does not repeat the treatment.

Radium Treatment of Malignancy of the Eyelid. C. AUGUSTUS SIMPSON, M. D., The Urologic and Cutaneous Review, 28:276-278, May, 1924.

IN radiotherapy of cancer of the eyelid it is necessary to confine the rays absolutely to the lesion, at the same time avoiding injury to the globe. This requires more than the

usual skill and care in technique and the operator should have considerable previous experience in treatments of warts, senile keratoses, epitheliomas, etc., before he attempts to treat malignancy of the eyelid.

He should see to it that he has plaques of sufficient strength to allow filtration up to 1 mm. Al. This will obviate too long exposure and a waste of time but most important is the fact that the more massive the treatments the better will be the results. The author is convinced that the stronger plaque allows one to cure certain infiltrated and ulcerated lesions that the half strength application would only temporarily benefit. A recurrence of a growth on the eyelid is a serious matter.

For thirteen years the author used only x-rays in treating these malignancies but during the past ten years he has used radium as an adjunct. He has found that a primary growth upon the eyelid, previously untreated, will yield almost a 100 per cent cure if a triple strength applicator is used as an adjunct to massive filtered doses of x-ray. It is seldom that more than two applications are needed and treatments are never repeated less than two months apart. The applicator used by the author contains 30 mgs. of radium over an area two centimeters square, the window being covered with a composition which filters out less than two per cent of the x-ray. In raying epitheliomas he uses an aluminum filter ranging from 1/10 to 1 mm. in thickness and treatments range from one to four hours in length, depending upon the particular lesion being treated.

X-Ray Therapy in Actinomycosis. ALBERT F. TYLER, M. D., F. A. C. P., Urologic and Cutaneous Rev. 28:291-292, May, 1924.

IF there is bone involvement the diseased area should be thoroughly removed by a competent oral surgeon and as the nodules of the skin soften they should be incised, the contents pressed out and the cavity swabbed with tincture of iodine. X-ray should be applied thoroughly over all the indurated area, a sufficient dosage being used to produce epilation. The treatment should be repeated as often as the skin will tolerate it. Liquefaction takes place much more rapidly when radiation therapy is employed. The patient should be given potassium iodide internally to the point of tolerance as long as any induration exists and even for several weeks afterwards to insure the destruction of the fungus.

Etiology, pathology, symptoms and physical findings are given in the original paper.

X-Ray in Dermatology. STANTON S. MARCHBANKS, M. D., Urologic and Cutaneous Rev. 28:299-300, May, 1924.

THE author says that without x-rays, radium and ultraviolet rays, the dermatologist might just as well give up his practice. Some one, or two, or even all three forms of rays are indicated in the following skin conditions and diseases:

(1) Inflammations, except pella-gra, angioneurotic edema, dermatitis calorica, scarlet fever and measles. X-ray in particular is useful in the majority of inflammations other than those mentioned. (2) Hemorrhages (the purpuras), ultraviolet rays are more applicable. (3). Hypertrophies except elephantiasis, myxedema and dermatolysis. (4). Practically all atrophies are benefited by the ultraviolet ray. (5). New growths are all included except progressive pigmentary dermatosis, paraffinoma, lipoma, syphilis, fram-besia, gangosa (beginning ulcer, use ultraviolet), and leprosy. (6). In all neuroses. (7). In all diseases of appendages. (8). Parasitic affections, in all of a vegetable type but practically none of the animal type. (9) In all diseases of the mucous membranes adjacent to the skin. (10). Not in any hyperemia.

A Case of Displacement of the Ilium of Sixteen Months Standing: Painless Reposition: Immediate Recovery. EDGAR F. CYRIAX, M. D., Brit. J. Radiol. 19:135-140, April, 1924.

THE average general practitioner refuses to believe that a displacement of the ilium can occur. However, anatomy teaches that the sacro-iliac joint has a synovial membrane and an interarticular cartilage and has the potential possibilities of a movable joint. Even the few orthopedists who admit that a displacement can occur do not believe that reduction of the displacement is possible. The author of this paper says that not only is reduction of such a displacement possible but that it is the only cure.

He relates the history of a typical case. The patient, while lifting, had felt something give away in his back, as if torn. This was followed by a pain most marked to the left of the lumbar spine and radiating along the course of the sciatic nerve, down to the knee, sometimes extending to the ankle. After several months the pain

became modified to some degree but would become acute upon certain movements. After more than a year had passed the patient was x-rayed by Dr. Stanley Melville who reported there was some rotation of the lower lumbar vertebrae, especially of the fourth and fifth, some splaying of the left sacro-iliac joint, and that the left ilium was depressed so that its crest was about one-half inch lower than that of the right. A skiagram by a colleague confirmed Doctor Melville's diagnosis. It was decided that the rotary displacement of the left ilium was sufficient to have caused the patient's nervous symptoms and pain, and so reduction was decided upon. Manual vibrations (Kellgren's method), and gentle petrissage were first administered over the area, then the patient was placed upon his right side, the operator grasped the left ilium over the posterior superior spine, making a sudden forward and downward movement, whereupon the bone moved back into place, the movement being distinctly felt by both patient and operator. There was no pain experienced, but there was a fairly loud sound such as is heard when displacements are corrected in the extremities. There was immediate relief of pain both local and referred and the pelvic asymmetry was found to have vanished as skiagrams showed. The ilia were practically upon the same level and the rotation of the lumbar vertebrae were much diminished.

The roentgenologist, Doctor Melville, reports several similar cases.

A Radiographic Survey of the Normal Joints. ST. J. DUDLEY BUXTON, M. B., B. S., F. R. C. S., and ROBERT KNOX, M. D., Brit. J. Radiol. 19:115-124, April, 1924.

THIS article is the first of a series upon the joints of the body. The subject is to be taken up in as exhaustive a manner as possible by these two authors. A useful description and illustration of the normal joints will be given together with departures from the normal. Stereoscopic studies of the joints will be included in the illustrations.

This first article gives the technique for the radiographic examination of the shoulder joint, the standard positions for its radiography and the variations of these positions, the radiographic details of the pictured joint as a whole, followed by a description of the glenoid cavity, the joint from the anterior point of view and the appearances of the joint in infancy, youth and adult life. Fifteen plates illustrate the article.

Study of the Sternum by the Roentgen Rays. G. E. PFAHLER, M. D., Am. J. Roentgenol. 11:311-316, April, 1924.

EXTENSIVE metastatic carcinoma of the sternum may exist without objective symptoms, although on the other hand, there may be redness and tenderness. An x-ray picture will show irregular decalcification of the bone with no limiting margin of the disease and no regeneration of bone, unless roentgen therapy has been employed. A re-deposit of lime salts may follow upon roentgen therapy.

The sternum can be demonstrated only by eliminating the shadow of the spinal column which the usual anteroposterior or posteroanterior position does not do. The proper technique is: Patient erect in a true lateral position, tube centered over the middle of the sternum at a distance of 40 inches. An 8 to 10 inch film and a small cone are used. Exposure factors are 30 ma., 4 to 4½ inch gap, 8 to 12 seconds, double screens, superspeed films. Good results may be obtained with the patient recumbent but the erect position is the best.

In addition to the lateral position films should be taken in two other positions, namely, the right oblique in which the rays are passed from the left posterior to the right anterior, and the left oblique position in which the rays are passed from the right posterior to the left anterior. Both these positions require some preliminary study with the roentgenoscope, rotating the patient until the shadow of the spinal column, heart and aorta are projected away from the sternal shadow as far as is possible. After this has been done the patient retains the same position while a film or plate is substituted for the screen, the patient must of course be held absolutely still, by compression bands if necessary.

In the lateral position the screen is of little avail. The patient is turned laterally, hands back of the body, shoulders forced back by compression band to force the sternum forward as far as possible. The film is exposed during full inspiration. The top of the film is placed on a level with the upper border of the clavicles.

If all three positions are used any disease of the sternum should be recognized.

Fundamental Considerations Underlying Roentgen Therapy of Tonsils. EUGENE R. LEWIS, M. D., Ann. Otol. Rhinol. & Laryngol. 33: 198-204, March, 1924.

THE author is opposed to radical treatment of the tonsils and is especially opposed to x-ray treatment. He considers that "the employment of such a powerful agency as the x-ray under the direction of those unfamiliar with the physiologic and pathological fundamentals of the field and neighborhood in which they are working is distinctly dangerous." He says that the nose and throat men of greatest experience find great difficulty, are even at a loss, sometimes, to construe the findings in the throat and are quite unable at such times to definitely decide whether a tonsil is diseased or not. He asks how can the roentgenologist, then, possess sufficient knowledge of these things to be guided in his tonsil treatment.

Even though the tonsils are undoubtedly diseased there is only one justification for their removal and this lies in the existence of the second, third and fourth lines of defense in the lymph nodes backing up the tonsil, as these nodes take the place of the tonsil in the defense activities of this area.

In x-ray treatment whatever destruction of lymphoid tissue is accomplished in the tonsil is preceded by destruction of the lymphoid tissue in these nodes.

Further Notes on the Treatment of Pertussis by the Roentgen Ray. HENRY I. BOWDITCH, M. D., J. A. M. A. 82:1422-1424, May 3, 1924.

IN his conclusion and summary Doctor Bowditch says that in 300 cases of whooping cough treated by the roentgen rays there was found strong evidence that more than 80 per cent were benefited by the treatment. There was only one death in the series. The most favorable results seemed to be obtained in the early stages of the disease and in young children.

The author asks the medical profession and the public to give this method a fair trial.

Indications for Roentgen Therapy in Chronic Tonsillitis and Pharyngitis. W. D. WITHERBEE, M. D., Am. J. Roentgenol. 11:331-333, April, 1924.

THE author concludes that roentgenotherapy given previous to operation materially lessens the amount of dissection necessary for the removal of tonsils, thereby decreasing the possibility of complications. It is recommended for the following cases: (1) Where an anesthetic or operation is contra-indicated. (2) Cases past middle life where hemorrhage may cause complications due to a mild or severe

arteriosclerosis. (3) Patients whose tonsils are imbedded in infected tissue in which the operation may cause dissemination of septic emboli into the blood and lymph streams, thus producing lung abscess, septicemia, endocarditis, etc. (4) Patients whose adjacent lymphatic structures (not removable by operation), are markedly infected. (5) Patients suffering from chronic cardiac lesions, Bright's disease, diabetes, exophthalmic goiter, chorea, rheumatism, hemophilia, asthma, tuberculosis, status lymphaticus or any condition which has lowered the patient's general resistance. (6) Patients subject to frequent attacks of peritonsillar abscess (quinsy). (7) Vocalists and public speakers subject to frequent attacks of tonsillitis and pharyngitis. (8) Patients suffering from recurrent pharyngitis after removal of tonsils and adenoids.

The author says that some of the unfavorable results obtained by this method may be accounted for by the fact that the ray was directed through the angle and ramus of the jaw instead of through the soft tissues behind the jaw.

Surgical Diathermy by the Needle Method. ALFRED LEVY, M. D., Ann. Otol. Rhinol. & Laryngol. 32:1086-1094, December, 1923.

THE first essential is a machine which will deliver a current of just sufficient voltage to insure its traversing as much of the body as lies between the two electrodes, yet not so high as to cause any difficulty in insulating the cords and electrodes.

The milliamperage must be sufficient to generate enough heat at the small electrode to coagulate the tissues immediately surrounding it, 500 to 1000 are usually sufficient, though a higher milliamperage may be required for larger masses of tissue. A good foot switch and well insulated cords and electrodes are indispensable. Most workers use a large electrode at least six by eight inches and cover it with towels wet in a five to ten per cent solution of salt. The towel must not be allowed to become dry in any spot, else all the current will pass through the wet area and cause a burn. This must be constantly watched. Much of the danger from burns can be obviated by the use of an uncovered block tin electrode bandaged onto the body with the patient lying on it. The connecting wire is hooked into an eyelet and this part is carefully protected.

The operating needle should be in a well insulated handle and may be of any length. It is covered with a rubber catheter exposing only so

much as the depth to be penetrated. The needle is inserted before switching on the current which is turned off again before removing the needle, otherwise sparking and a burn may result. The needle does away with a considerable number of special tips, it can be accurately placed and made to traverse several layers of tissue through fascial planes with accuracy as to amount and depth of tissue coagulated. The needle is preferable for deeper applications and where more than one layer of tissue is to be coagulated. The disc electrode is useful in superficial work.

Most writers advocate that the application be stopped as soon as steaming is observed. This is to avoid sparking which occurs whenever an area becomes carbonized, and therefore a poor conductor, with the result that coagulation in the deeper parts ceases, theoretically. The author, however, says that he has noticed the coagulated area to extend even after carbonizing and sparking when the needle is used.

In the neck the proximity of the large vessels and of the important nerves must be kept in mind when working here, although the blood vessels are protected to some extent by the rapid blood flow.

Some advise preliminary ligature, especially of the lingual, but the author doubts the wisdom of this, especially in case of the carotid and jugular where the circulation probably protects the pneumogastric nerve. If malignancy has penetrated to this depth it is probably hopeless anyway.

Operations in and about the larynx require tracheotomy but if dessication alone is used this will not be necessary. "Dessication" describes what takes place in the tissue when the spark is used and is a useful process in superficial or diminutive lesions and has an advantage in skin lesions that it leaves a smooth white scar, whereas coagulation may cause keloid.

The advantages of surgical diathermy are that otherwise inoperable tumors may be attacked; the operation is more or less bloodless; danger of metastases is less than with the knife because of the sealing of blood vessels and lymphatics; there is sterilization of the parts; complete destruction of the visible and palpable malignant disease; operation is rapid and easy; there is no surgical shock; convalescence is rapid and adhesions only rarely occur; lastly, the operation can be repeated if necessary.

The disadvantages are that healthy and diseased tissues are equally destroyed; the surgeon cannot see im-

portant vessels and nerves; there is danger from secondary hemorrhage when operating near large blood vessels; there is a tendency to formation of keloid in operations involving skin surfaces; and in operating near bone, destruction of the periosteum may lead to a long continued suppuration.

X-Ray As An Advance in the Treatment of Impaired Hearing. J. J. RICHARDSON, M. D., F. A. C. S., Jour. M. A. Georgia, 13:161-165, April 13, 1924.

THE author's experience with about 600 cases indicates that x-ray treatment for impaired hearing challenges the attention of the progressive otologist.

Improvement is either astonishingly immediate or may be for some time latent and it may be followed in some cases by a relapse, which has never reached the low level of the first condition in any of the author's cases.

Usually there is first an improvement in an increased power to interpret the conversational voice, then music in orchestral form, the metallic sounds, such as the ringing of the telephone bell, etc. There is very generally a disappearance of tinnitus aurium. The treatment is entirely free from danger to the patient.

The author used a low voltage equivalent to about a 4 in. spark gap, or 50 kv. and about 8 ma. The head is irradiated from four angles: (1) through the temporal region on the right, directing the central ray one inch in front and one inch above the external auditory meatus; (2) over the occipital protuberance, with the head inclined forward; (3) left temporal region in same manner as the right; (4) through the anterior fontanelle, head inclined backward. The quantity of energy used should be kept constant and non-fluctuating. A carefully stabilized current yields best results.

If there is anatomical pathology, e. g., lymphatic hyperplasia or middle ear inflammation it is best to use in addition to the small photo-electric dosage already mentioned a heavier dosage such as is used to reduce hyperplastic tissues. Applications are proportioned to the extent of the pathology revealed and are repeated only at sparse intervals.

The x-ray treatment is purely adjuvant of course, and all possible clinical aid should be sought.

A Modification of Technique for Roentgenographing the Upper Molars. A Speedy Technique for Roentgenographing the Teeth. C.

A. LE MASTER, D. D. S., Dental Cosmos 66:433-436, April, 1924.

IT is rarely that a roentgenogram of the upper molars shows the three roots and their apices in normal position and relationship to one another and to the surrounding process and structures without the superimposition of the zygomatic arch and antrum shadows.

The factors of exposure and development may vary within considerable limits without impairing the diagnostic value of the picture but the factor of the angle of incidence of the roentgen rays in relation to the film and tooth must not vary in the least; the rule is that the angle of incidence of the normal ray shall strike at right angles the plane which exactly bisects the angle formed between the tooth and the film. Deviation from this law will result in foreshortening or elongating the picture of the tooth. The superimposed shadows of the zygomatic arch, and the lower border of the maxillary sinus are often projected over the molar roots and cause great confusion. Frequently distortion will make the apices of the molars and bicusps appear to extend into the antrum. A roentgenogram taken in the usual position, to avoid distortion, will lead one to overlook some important diagnostic features.

To obviate this difficulty the author says one must modify the angle of the film to the tooth, thereby obtaining a view of the upper molars without the superimposition of the above described shadows and without distortion. In other words, place the film approximately parallel to the long axis of the tooth (as in technique for lower molars) and the ray can be directed below the zygomatic arch and the antrum.

This may be done by attaching a No. 3 size cotton roll (or any radiolucent sterile material) to the film. This roll is used for only the high vaulted or medium vaulted cases. If the palate is low vaulted and broad it will be necessary to use a cork with aluminum wedge as the cotton roll would not hold the film far enough from the lower edge of the crown of the tooth. The wedge must be thick enough at its base to make the film parallel to the long axis of the tooth. These materials may be attached to the film by a mixture made from 50 per cent alcohol in which there has been dissolved strips of celluloid (old films with emulsion removed by hot water).

With the cotton roll on the lower border of the film, the roll is placed in apposition to the crown of the tooth. The upper edge of the film

is bent slightly to conform to the form of the palate and to give a surface for the patient's finger to rest as he exerts a holding force upward against the hard palate but without compressing the cotton roll too much against the crown of the tooth. This places the long axis of the film approximately parallel to the long axis of the tooth and the rays can then be directed approximately parallel to the long axis of the film or tooth, the same as for the lower molars.

In the case of a patient unable to hold still for dental exposures the author has obtained ideal results with one-fifteenth second exposures. The first exposure was as follows: 18 in. distance 40 ma.; 4 in. penetration, 10 sec.; result was scarcely an outline of the teeth. The author then gradually increased the ma. up to 50, always keeping the penetration at four inches, when the outline obtained was clear. The last exposure was ideal and was taken with a distance of 18 inches; time, 15 sec.; the speed dental film; penetration, 4 inches; 80 to 90 ma. This last is not exact but was very nearly 80 to 90 ma. He then marked the position of the Coolidge rheostat and transformer so that he can always obtain approximately the same exposure each time. He finds a tube of the 30 ma. type holds up well under such usage.

Clinical Results of Deep X-Ray Therapy. Brit. M. J., 1:572-574, March 29, 1924.

THIS discussion on the clinical results of deep x-ray therapy took place at a meeting of the Section of Electrotherapeutics of the Royal Society of Medicine, March 21st.

Dr. Turrell was in the chair and at the close of the discussion he said it was the best that he had ever heard.

Dr. William Mitchell said that he used the Wintz technique and that during the first sixteen months he had treated 133 cases of carcinoma of various kinds, 30 of which were carcinomas of the breast. Of the whole number of cases, 48 were perfectly hopeless from the beginning. He believes it useless to promise cures by deep x-ray therapy. The only cases really doing well are those where the patient's general condition was good to begin with, a good blood count and hemoglobin index being present.

Mr. Sampson Handley said that the time was past when surgery alone could deal with malignancies and that the help of the radiologist was necessary in nearly all cases but that he was not sure that deep x-ray therapy was the help sought and needed.

He believes that a mean must be found between the extremes and that the balance as yet has not been struck. In deep x-ray therapy, irradiation of the tissues generally was hard to avoid and so the effect was generally deleterious.

Dr. George Cooper said that in estimating the present status of deep therapy it should be remembered that radiologists were being called upon to treat cases of a much more advanced and desperate character than formerly.

Dr. Robert Knox said that deep x-ray therapy was not new but was an extension of superficial therapy and the matter resolved itself into a question of wave-length. The radiologist should direct his efforts to supplement nature's efforts at repair instead of depressing them. In general the effects are uncertain and are most so in carcinoma.

Dr. Reginald Martin said that beyond the fact that modern development had extended the range of the radiologist's activities he doubted whether there was greater control of malignant diseases.

Dr. Curtis Webb said that he employed the Erlangen massive dose and that he was very much encouraged by the use of the treatment in cases at all suitable.

Dr. N. S. Finzi unhesitatingly declared that the new methods were better than the old, a large number of the bad results he thinks, are due to faulty technique. A combination of x-rays and radium often gives better results.

Dr. Louisa Martindale said that she had found little trouble with roentgen sickness. She prepares her patients as for abdominal operation.

Dr. Turrell in closing said that in combined treatment diathermy might be more used. Also he does not believe that deep therapy is justifiable for the treatment of fibroids in patients near the menopause. Bordier's principle of repeated small doses brings about the menopause in a most excellent way.

Some Experiences in and Considerations of Deep X-Ray Therapy. J. CURTIS WEBB, M. D., B. Ch., Brit. M. J., 1:622-624, April 5, 1924.

THE author has used deep x-ray therapy for about 18 months and says that during that time he has had very instructive cases though it is too early yet to speak of end-results. He states that, in France, Belgium, Germany, Austria and Italy and largely in America, x-ray therapy is regarded as the treatment of choice in ordinary cases of fibromyoma; either one deep massive dose

is given or else weaker divided doses. Surgery is used only when there are definite symptoms of pressure or temperature, etc. Where malignant changes are suspected deep therapy is the general rule if it is available. The author says he is at a loss to understand the English opposition to this form of treatment. He believes that Continental statistics generally prove that the chances in carcinoma of the cervix and the uterus are better with deep x-ray therapy than with surgery. Deep therapy is merely a development and an improvement of the older technique. The pastille method of measuring dosage should never be employed in this age when a more scientific way has been developed. Wintz has demonstrated that the lethal dose to the tumor is not always the curative dose to the patient. Many factors besides radiation enter into the end-result, and after care of the patient is one of the most important. He quotes some interesting statistics from Wintz based on 326 cases. These were classified as (Class I) those who had good homes, nourishment and after care; (Class II) those who had to struggle for a living, facing poverty and anxiety and who, therefore, could not have proper after care. The end-results are thus listed:

After 4 years 26 per cent more of Class I alive than Class II.

After 3 years 22.5 per cent more of Class I alive than Class II.

After 2 years 23.5 per cent more of Class I alive than Class II.

The author has found chloretone administration and the use of drop enemas of saline solution useful in relieving the nausea after treatment.

Radiations in the Treatment of Malignant Disease. F. HERNAMAN-JOHNSON, M. D., Brit. M. J., 1:648, April 5, 1924.

THE author says that the deep (Erlangen) method is depressing to the patient's vitality and that whatever its merits it is not in any way suitable as a surgical adjunct. The surgeon may reasonably ask the following things of the radiologist: (1) that an inoperable case be rendered operable; (2) that something be done to reduce the likelihood of recurrence; (3) and that this be done without in any way making the patient less fit.

It is often possible to make an inoperable case operable by comparatively small doses of rays given every other day for weeks, at the end of which time the patient will feel better than before the treatments. He adds that no responsible medical man would dare make such a state-

ment unless he could prove it by surgical testimony. As a prophylactic postoperative treatment he heartily endorses a similar technique. The "stimulating dose" theory is a bogey and has done much harm by preventing workers not in possession of intensive apparatus from giving relief with such apparatus as they had. An humble outfit in skilled hands can give great relief to inoperable or recurrent cases. In widespread cases drastic methods are necessary but the unmodified Erlangen technique is not suitable.

A second course of intense treatment seldom gives as good an effect. A diet rich in vitamins, fresh air and sunlight all help. Artificial sunlight should be made use of as a complete sun effect can be built up with present day apparatus.

Radiation in the Treatment of Malignant Disease. J. HALL-EDWARDS, M. D., Brit. M. J., 1:689, April 12, 1924.

DR. HALL-EDWARDS agrees with Dr. Hernaman-Johnson that in many cases the Erlangen technique has nothing more to offer than is to be obtained from less costly apparatus skilfully handled.

Wintz, says the writer, overcomes the dangers of his method by virtue of having a special hospital where control is exercised under such conditions as are almost unknown in England where deep therapy apparatus is often used under any but perfect conditions.

The writer briefly reports a number of cases postoperatively treated by small doses of x-rays. The lives of these patients were prolonged from a few weeks to many years. One patient now under treatment has had both breasts removed and has had several subsequent operations for smaller recurrences. For the past three years she has been receiving x-ray treatments at intervals and there is no sign of a recurrence. The chest of this patient has been exposed to the sunlight and fresh air for two or more weeks in each year.

In a communication from Dr. Hernaman-Johnson in which he comments upon this article by Dr. Hall-Edwards (Brit. M. J., April 19, 1924, p. 739), he agrees with Dr. Hall-Edwards in stressing the value of the small dose but he thinks the converse should be emphasized, namely that in certain circumstances better results are obtained by concentrating into a few days a dosage which once would have been spread over many weeks. He does not approve of the single massive dose, but Erlangen has demonstrated the value of concentrated

dosage; though the theory of the "cancer dose" is absurd, as it is too near akin to medieval cabalistic formulae. However, a valuable therapeutic method should not be damned by a futile theory. A course of x-ray treatment packed into four or five days sometimes has its proper place in x-ray therapy and should be made use of at such times.

Dr. William Mitchell in the British Medical Journal of May 3rd, p. 801, says that his experience with the Erlangen technique coincides with that of Dr. Hernaman-Johnson and Dr. Hall-Edwards and he has advised against the installment of a second apparatus in his clinic.

The X-Ray As An Aid in the Differential Diagnosis of Abdominal and Chest Conditions. LOUIS EDEIKEN, M. D., Med. J. & Rec. 119:492-493, May, 1924.

THE roentgen ray is often an easy means of identification between early pneumonia and acute appendicitis. The symptoms may be the same in each of these but if there is an existent pneumonia the normal radiability of the lungs will be disturbed. At Mt. Sinai Hospital all children in whom an acute appendicitis is suspected are given an x-ray of the chest to eliminate the possibility of pneumonia.

Empyema is a condition frequently confused with subphrenic abscess as symptoms and physical signs are similar. The history, however, differs, and diagnosis can be easily made by means of the fluoroscope and films. In subphrenic abscess the diaphragm is greatly elevated and its respiratory excursion restricted, the costophrenic angle is clear and the radiability of the lung is normal. There is increased density over the liver area. In empyema the picture is entirely different for the diaphragm is not seen, the costophrenic angle is obliterated and a fluid level is seen. Instead of a normal lung radiability there is a dense shadow in the lower part.

Pain due to pleurisy often stimulates that due to cholecystitis. Pleurisy will show limitation of the excursions of the diaphragm and there may be evidence of pleural adhesions or thickening. If the pain is of gall-bladder origin the x-ray of the gall bladder may be of great value. The author considers a gall-bladder shadow pathological. If routine pictorial study reveals nothing abnormal in the gall-bladder, bismuth study of the stomach and duodenum may give some information. Gastroparesis, six hour retention and hyperperistalsis suggest cholecystitis. Distortion of

the duodenal cap without other signs of ulcer justify a diagnosis of pericholecystitis with adhesions. Without a combination of these methods no negative gall-bladder diagnosis should be made.

Roentgenography should be used to differentiate traumatic pneumothorax or hemopneumothorax from abdominal perforation and hemorrhage of traumatic origin. In these the clinical picture may be the same but of course the treatment differs radically.

The rays are useful also to differentiate cardiac and aortic lesions from suspected lesions of the stomach and duodenum; lower esophageal conditions from gastric lesions; and tumors of the liver and spleen from masses in the lower lobes of the lungs.

The Value of the Roentgen Examination in the Early Diagnosis of Postoperative Ileus. JAMES T. CASE, M. D., Ann. Surg. 79:715-725, May, 1924.

IN the treatment of postoperative ileus early recognition of the condition is of greatest importance in order that the profound general depression attending the later stages of obstruction may be minimized or averted.

This paper describes a simple and quick method for shortening the time of observation before reaching a decision to intervene. The test will not differentiate with certainty between the paralytic and the mechanical forms of ileus, nor will it always give the exact site of the obstruction but it will show whether obstruction does or does not exist.

Barium is seldom necessary, especially after one has had a little experience in reading these plates, but a very little is sometimes used, as will be described later. A portable roentgen outfit is used and a 14 by 17 inch film with a screen in the proper film holder is slipped beneath the patient's abdomen with the interiliac line slightly below the middle of the film. Dressings are not removed and the bedclothes may be replaced, once the tube is centered over the middle of the abdomen. The patient must hold his breath for from two to four seconds when making the exposure. The whole procedure need not occupy more than five minutes.

The film will show whether there is any gas distention of bowel or stomach and whether it is in the stomach or the large or small intestine. In serious cases the degree of distention will be sufficiently marked to be apparent and suggestive. Observation of the roentgen film helps

ful for if the cecal region contains gas it is not likely that the obstruction is in the small bowel. If the gas occupies the middle of the abdominal shadow while the flanks are gas free, the obstruction is probably in the lower ileum but not as low as the ileocecal valve. When the gas occupies the true pelvis and the middle of the abdominal shadow the ileocecal region may be suspected. Intussusception may be recognized by colonic injection with an opaque enema in doubtful cases. A small amount of barium sulphate (1½ oz.) may be given by mouth if necessary.

Of course, the method is useful only in immediately postoperative cases, that is, about the third day from operation, as the bowel is then practically empty.

The paper is based upon the author's observation of about 700 cases.

A Technique for the Application of Radium Emanation in Carcinoma of the Prostate. ERNEST M. WATSON, M. D., New York State Institute for Study of Malignant Disease, Buffalo General Hospital Bulletin, 2:1921, January, 1924.

THE author describes the procedure by which 1500 to 2000 mc. hrs. of radium can be accurately deposited within the prostate, seminal vesicles and trigone, within eight or ten minutes under novocaine anesthesia. No prolonged instrumentation is necessary nor is there continued distress to the patient. Copies of this article can probably be secured by addressing the Buffalo General Hospital where the Bulletin is edited.

The Electrocautery in the Treatment of Laryngeal Tuberculosis. JOSEPH B. GREENE, M. D., Ann. Otol. Rhinol. Laryngol. 33:193-197, March, 1924.

THIS is not a new method but it is one deserving greater recognition than it has yet received. The cautery is not a radical measure, for the reaction is usually slight and no attempt is made to remove all the diseased tissue but rather to stimulate the formation of new blood vessels with later development of scar tissue.

Wood has practically abandoned all other forms of topical applications. Fetterolf, Freudenthal, Levy and others have urged its more general use.

Too much should not be attempted at one time and an interval of several weeks should elapse before treatment is repeated.

In late stages and with extensive laryngeal involvement the cautery is useful only to sear ulcerations for the relief of pain. In such cases injection of the internal laryngeal nerve with alcohol or a cocaine spray may be necessary.

The cautery is rarely applied to the cords unless there be a well localized infiltrated area readily reached by the cautery. However, if there is a localized ulcer on the cord with no tendency to heal, the cautery may be used to prevent further destruction.

Prominent tuberculous infections in the posterior commissure respond well to the cautery, as do lesions of the vocal bands though they must not be cauterized too much at one sitting. Large and swollen arytenoids shrink markedly after a few punctures and the pain is often ameliorated. Tuberculosis of the epiglottis is the most painful lesion of the larynx and is the least benefited by injection of the internal laryngeal nerve, yet it is astonishing how rapidly the pain disappears after a few punctures by the cautery. Ulcerations should have superficial cauterization.

In the milium form of pharyngeal tuberculosis where there are superficial grayish patches on the pharynx no treatment will avail, but for ulcerations in ordinary pharyngeal tuberculosis no other form of treatment compares with the electrocautery.

A Physiotherapy Treatment for Anemia and Amenorrhea in Young Women. LEO C. DONNELLY, M. D., Am. J. Electroth. & Radiol. 42:130-131, April, 1924.

ULTRAVIOLET RAYS stimulate calcium, phosphorus, iron and endocrine metabolism and they also increase the skin's physiological action, making it almost impossible for any skin infection to exist or occur.

Diathermy stimulates the red and yellow bone marrow metabolism and the sinusoidal current is used to stimulate the uterus, ovaries and tubes.

In giving the ultraviolet treatments erythema doses are given over the front, back and sides of the patient, and are repeated as soon as the resultant erythema begins to fade. Following the general irradiations the patient lies on her face under a therapeutic lamp which is placed at a height that sheds a comfortable warmth. Twenty-two B. and S. gauge sheet-lead electrodes are placed over the outer lower portion of both thighs so as to cover the epiphysis of the femurs. A similar electrode connects the inner portion of the thighs. The D'Arsonval high fre-

quency current is allowed to pass through the epiphysis for half an hour or more. The intensity is gauged by the toleration of the patient, a comfortable heat is optimum. The rise of temperature so induced and the increased blood supply increases the efficiency of the metabolism of the red and yellow marrow of the long bones, the results comparing favorably with the transfusion of whole blood.

"The body of the uterus is supplied by the tenth, eleventh and twelfth dorsal segments, the cervix by the third and fourth lumbar and sometimes by the first and second sacral segments, the ovary by the tenth, and the fallopian tube by the eleventh and twelfth dorsal and first lumbar segments (Behan). These nerves come off at the levels of the seventh dorsal to the twelfth dorsal spinous process (Cunningham). Two moist electrodes covered with the chamois skin are placed so as to stimulate these nerves and a slow mechanical wave current is given for twenty minutes which causes the uterus and tubes to alternately contract and relax, which greatly increases the flow of blood through them. It has been shown many, many times that this method of treatment can develop an infantile uterus to a normal sized uterus."

Case Reports: Tuberculous Cervical Adenitis and Chronic Eczema.
CHARLES R. BROOKS, M. D., and
DAVID E. EHRLICH, M. D., Am. J.
Electroth. & Radiol. 42:132-134,
April, 1924.

THE authors utter warning as to the importance of cleansing all skin lesions before giving ultraviolet irradiations as the radiations are retarded by scales, scabs, and discharges. General tonic ultraviolet raying of the body is given in addition to the local applications.

The ultraviolet rays from a water cooled lamp should be given under compression or as nearly so as possible with the quartz window pressed against the skin or the solid quartz applicators under compression to de-hematize the part in order to obtain maximum penetration.

When giving intensive local ultraviolet applications the surrounding and intervening normal skin should be protected with cold cream, vaseline, moist absorbent cotton, etc.

Repetition of ultraviolet irradiations to a part increases the skin's tolerance to x-rays. In treating skin lesions one should always correct dietary errors and eliminate any focal infection existing.

Combined x-ray and ultraviolet ir-

radiations are more effective than either alone, and the author reports conspicuous success in tuberculous adenitis and chronic types of eczema with severe pruritis which have resisted local medication for years.

In cervical adenopathies preference should always be given some non-operative procedure as operations are frequently followed by fistula and resultant unsightly scars which are often painful and adherent to the underlying tissues. When a gland becomes reduced in size so that it is a hard fibrous nodule surgical intervention is required.

The authors attribute much of their success to cooperation between the x-ray department and the physiotherapy department.

Treatment of Tumors of the Bladder.
HOWARD A. KELLY, M. D., F. A. C.
S., and WILLIAM NEILL, JR., M. D.,
Urologic and Cutaneous Rev. 28:
257-259, May, 1924.

SURGICAL treatment of these tumors should be relegated to a very subordinate place. Radium (and it is hoped in the not far distant future, x-ray), is the one very valuable agent in this field.

The cases treated by the authors include more or less extensively infiltrated squamous-cell carcinoma, papillary carcinoma and a group metastatic from cancer of the cervix. Only such papillary growths as were microscopically proved malignant or which had an ulcerated and infiltrated base are listed as carcinomata.

The methods of using radium were: (1) By implantation into the base or into the tumor; not used in the more extensive ulcerative lesions, however. (2) Direct surface application. (3) Intravaginally, through the vesico-vaginal septum. (4) Massive exterior treatment through the suprapubic region, through the vulva and the sacrococcygeal area. It is not yet possible to evaluate these various methods of using radium but the massive distance treatments can only be used effectively where at least a gram, or better still from two to four grams are available. Remarkable recent successes in their clinic are causing the authors to revise their opinion of the greater potency of the heavy distance treatment.

Fulguration, they believe, is of most value in eliminating superficial flat areas of disease as it makes little impression on a massive tumor at one sitting. It is worse than useless in papillary carcinoma with infiltration but it simplifies, extends and helps the radium application in removing masses of disease and in curing the patient quickly in the simpler

cases and in limiting the field for radium to those in which the bladder wall is invaded.

On the Reasons for Choice of Radium or X-Ray When Radiotherapy is Indicated. WALTER S. LAWRENCE, M. D., Urologic and Cutaneous Rev. 28:294-296, May, 1924.

THE author in concluding this article says that any surface lesion of small extent may be treated by either radium or soft x-rays, unfiltered, with equal prospect of success. Any large or multiple surface lesion should be treated with soft x-rays rather than radium, as a time saving measure. Any malignancy within a cavity body so situated that a radium capsule may be placed against it and at the same time be kept at a safe distance from normal tissue, or any such lesion that can be thoroughly transfixed by radium needless, should be treated by radium. In such cases the intense local action of radium is far superior to the widespread more general action of the x-ray. Certain of these cavity cases have become extensive with glandular involvement. These should be treated with radium within and also high voltage x-ray by cross fire from without.

Malignant papilloma of the bladder would at first thought seem to be particularly suitable for treatment by radium. But the difficulty of application is so great that most of these cases will do better by deep x-ray therapy.

Nowhere have the results of radium therapy been more brilliant than in cancer of the cervix. In quite early cases a sufficient application of radium will usually bring about a complete and lasting cure. In more advanced cases radium alone may cure; but all of these cases would be safer if the x-rays from without were added to the radium from within. Many of the advanced cases, even with a so-called frozen pelvis, may be saved by large doses of radium within and equally large doses of high voltage x-ray from without.

Cancer of the lower lip can possibly be treated better with the x-ray. The dose should be large, the whole lip thoroughly saturated with fairly penetrating filtered x-rays, while the glandular region should be treated by rays of greater penetration.

All deep seated or widespread malignancies not in body cavities should be treated by high voltage x-ray and not by radium.

Strictly speaking, there is no such thing as deep therapy by means of radium, for if it were attempted to

withdraw the radium to such a distance from the skin as would tend to equalize the surface dose and depth dose, the time of application for one dose would run into months and years—beyond a reasonable time limit.

Neither the x-ray nor radium can accomplish all that can be accomplished by radiotherapy. These agents should be regarded more as supplements than substitutes.

Newer Phases in the Roentgen Interpretation of Duodenal Ulcer. JOSEPH S. DIAMOND, M. D., Am. J. Roentgenol. 11:317-327, April, 1924.

THE author discusses the architectural structure of the first portion of the duodenum and its influences upon the configuration of the duodenum in ulcer lesions. He shows that a supporting structure or fulcrum is formed on the lesser curvature side of the bulb which is brought about by the larger number of longitudinal muscle fibers continued from the lesser curvature of the stomach, forming a thick bundle as it were, stimulating the tenia coli, which in view of its importance may be called "tenia bulb. doudenii." This is further strengthened by the suspensory effect of the duodenohepatic ligament.

The author presents a series of 30 cases, revealing 20 (66%) niches; 18 functional defects (12 associated with niches), 6 organic defects representing old callous ulcers; 19 (95%) of the 20 niches revealed an accompanying retraction. Diverticula were noted six times.

The niche may vary from a mucosal defect to a deep penetrating ulcer. A duodenal defect is most often functional in nature and is produced by a contraction of the circular muscle fibers upon the longitudinal bundles on the lesser curvature side and seldom represents the ulcer base, the ulcer usually being opposite to and in the same segment of the defect. The defect is less often produced by such changes as scar formation or induration.

Another type of spastic contracture has been shown, "retraction," most often found on the lesser curvature side, surrounding the base of the niche and due to contraction of the longitudinal bundle itself, thus often intensifying the appearance and size of the niche.

The administration of belladonna for forty-eight hours and the restriction of the patient to a milk diet invariably causes a relaxation of the accompanying spasm, thus permitting the filling of the niche which was not

visualized in the previous examination. This method of re-examination has increased the number of visualized niches.

Diverticula situated orally to the lesion are usually pulsion diverticula, produced by functional or organic constrictions in the distal portion of the duodenum. These can be differentiated from a niche by their ability to contract, changing in size and contour from plate to plate, they can be seen to fill and empty as they participate in function with the remainder of the duodenum.

One must differentiate between a niche, infiltration, scar and spastic stricture. This can be done by following a definite plan and applying oneself to the minute study of the character of the changes in each border, always bearing in mind the pathological entities which may affect the duodenum and the manner in which these express themselves under the roentgen ray.

Functional Restoration of the Incompetent Ileocecal Valve. FREDERICK H. MORSE, M. D., Am. J. Electroth. & Radiol. 42:111-116, April, 1924.

THE importance of recognizing intestinal stasis and of knowing its exact location and appreciating its relation to the rest of the body is the subject of this paper. The only way to determine ileocecal incompetency and consequent ileal stasis is by means of a properly prepared bowel and a barium or bismuth enema. Ileocecal incompetency and the resultant ileal stasis which does not respond to drugs or surgery can often be cared for by the wave generator used directly through the ileocecal region, selecting motions that will best apply to the peristalsis of the region treated. Very slow or very rapid invigoration beyond that which physiology teaches is normal action for the part, will either fail in its effects or will exhaust by overstimulation. Six cases are reported cured.

Roentgenology in Urology and Dermatology. WILLIAM BENHAM SNOW, M. D., Urologic and Cutaneous Rev. 28:285-289, May, 1924.

UNSATISFACTORY results sometimes complained of by the surgeon are often due to inefficient technique. If metastasis is to be prevented and controlled in pelvic cancer, then the x-ray, whether associated with surgery dissection or electrocoagulation, must be employed with an adequate use of broad exposure over the abdomen, at least to the level of the umbilicus.

The action of radium in the treatment of malignancy is localized in its effect and should never be used in the treatment of malignancy in the pelvic regions or elsewhere without the joint use of the x-ray.

After long experience the writer believes that a seven inch spark resistance between metal points on the transformer apparatus is adequate to effect malignant growths in any part of the body.

Great caution should be observed in using massive doses of x-ray over large tumors, internal or external, lest by breaking up and disintegrating they terminate in speedy death. By graded small doses many tumors will disappear without endangering life.

Localization of Calculi in the Region of the Kidneys by Roentgenography. WALTER C. BARKER, M. D., Urologic and Cutaneous Rev. 28:282-284, May, 1924.

WHEN a calcareous body is found in the region of the kidney before a diagnosis is made, clinical experience has proved that careful localization is necessary. If pyelotomy is contemplated for the removal of the stone then pyelography is necessary to determine whether the stone is in the upper end of the ureter, the pelvis or calices of the kidney. The value of this information will be greatly appreciated by the surgeon.

When radiopaque bodies occur along the course of the ureter the use of the opaque ureteral catheter without the injection of fluid is sufficient for localization. Projection from two different angles will determine whether the calculus is outside or within the lumen.

Perspective in Urinary Tract Examination. SAMUEL J. ALDEN, M. D., Urologic and Cutaneous Rev. 28:278-282, May, 1924.

COMPREHENSIVE consideration and examination should be made in all cases to exclude conditions other than those indicated by subjective symptoms. Search should be prosecuted for pulmonary, cardiovascular or gastro-intestinal changes or focal infections as causative factors. Examination of the urinary tract should include physical, clinical and radiological findings. X-ray examination should not be limited to small areas, e. g., if one examines only one kidney he may miss the pathology for the pain may be referred and the disease be in the opposite side to which the patient thinks it is.

Treatment of Hypertrophy of the Prostate by X-Ray and Physiotherapy. ORREN W. WYATT, M. D., Urologic and Cutaneous Rev. 28: 304-305, May, 1924.

THERE should be a careful examination of the patient, both general and local; a clinical classification of the prostatic hypertrophy by sense of touch; hygienic management of the patient; the application of various physiotherapeutic measures for relief of chronic inflammation and infection of the genito-urinary tract; roentgen ray in 100 per cent skin dose. Surgery should be the last resort. This method of procedure will spare patients many needless operations and premature deaths.

If the hypertrophy is due to chronic infection causing chronic inflammatory changes then diathermia is applied to the prostate, either directly or indirectly, the dosage being 500 to 900 ma. for ten to thirty minutes, gradually increasing the dosage. The prostatic electrode is placed in the rectum against the prostate, the other is placed over the pubis. This treatment is followed by an ionizing dose of x-ray and massage by the Morse sine wave or slow sinusoidal, to eliminate the debris and establish better circulation. Then the prostatic electrode is placed in the rectum against the prostate, the other over the lumbo-sacral region. The ultraviolet ray is used both locally and generally for its antiseptic and general systemic tonic effect.

If the case does not respond to these measures plus hygienic treatment a more radical method is called for, x-ray or surgery. Moderately hard and hard prostates are surgical cases. In inoperable cancer or sarcoma, x-ray treatment plus radium is the best form of treatment.

Radiation Therapy of Malignant Bladder Tumors. LOWELL S. GOIN, M. D., Urologic and Cutaneous Rev. 28:269-270, May, 1924.

THERE is no field for the blind application of radium in the bladder. It may be successfully used by application through the cystoscope if the tumor is accessible and if it can be seen in its entirety. In the absence of contra-indications the suprapubic method is preferable. Multiple tubes containing small quantities of radium emanation are best. Intravaginal or intrarectal application of radium may supplement the direct approach. Radium therapy should be followed by thorough radiation of the pelvis by x-rays.

Frequent and Painful Urination From Chronic Congestion of the Trigo-

num in Women. Urologic and Cutaneous Rev. 28:267-269, May, 1924.

TREATMENTS were with rhythmic static induced currents lasting from 20 to 30 minutes each and applied two or three times per week. There was great relief experienced in the author's cases and in one case, in spite of the cystocele present, the relief continues.

To exclude malignancy a cystoscopic examination is desirable before static treatment is instituted, the technique for which is as follows:

A metal electrode 11½ inches long and 1 inch in diameter is mounted on an insulated stem seven or eight inches in length and placed in the vagina in close proximity to the vesical trigone. The insulated parts of either electrode must be kept from contact with vulva, thighs or buttocks or the table, if it is not insulated. The patient lies on the back, the limbs need not be elevated, but some kind of a pad or sandbag at the handle of the electrode prevents the repeated slight contractions of the pelvic muscles from causing the electrode to slip out of the vagina which would cause disagreeable sparking. This electrode is connected with the key of a metronome such as is sold at the music stores to mark time. Part of the time the inverted pendulum is in contact with or very near the outer coating of a quart Leyden jar suspended from one pole of a static machine. A pint Leyden jar suspended from the other pole of the static machine has its outer coat connected with a flexible metal sheet electrode about four by five inches kept in contact with the abdomen by a small sandbag. With a spark gap of from one-half to two inches there will be a constant stream of sparks across the gap. Their intensity will be moderate while the metronome arm is separated from the Leyden jar but will be of great intensity when it is within sparking distance of the jar. This intensity must be regulated by inquiring as to the comfort of the patient. There will be contraction of the pelvic and abdominal muscles. Improvement is prompt.

Deep X-Ray Therapy in Carcinoma of the Prostate. ALBERT SOILAND, M. D., Urologic and Cutaneous Rev. 28:266-267, May, 1924.

THE author says: "It is fully understood that a form of therapy cannot be established on the record of a few cases and that sufficient time must elapse for the study of cases which have been benefited. However, we believe that in the short wave x-ray therapy we have an agent

which is of distinct value in the treatment of carcinoma of the prostate. By combining this method with surgery and radium in suitable cases, and alone or with radium in the advanced cases, there is a chance of definitely prolonging the patient's life, ameliorating his symptoms, making him more comfortable for a longer period of time, with a small chance of checking his disease entirely. The x-ray treatments may be given to the patient without danger and with practically no discomfort."

The X-ray Diagnosis of Shadows in the Right Upper Quadrant. EDWARD L. JENKINSON, M. D., Urologic and Cutaneous, Rev. 28:264-266, May, 1924.

THE bowel must be free of gas and fecal matter. Good films are essential. Examination in three directions should be made of all shadows in the right upper quadrant. Pyelography is indicated if the case is atypical and the location of the shadow cannot be determined by other methods.

The three directions are the antero-posterior, posteroanterior and lateral. It is essential that a true lateral be obtained. The patient must not be turned on his side as in a movable kidney for there is a tendency for the kidney to fall forward. Patient must be on his back. The film with double screens is placed at the right side and the rays are directed through from the left side. In this manner a true lateral is obtained without distortion. Sometimes pyelography will be necessary, examining the patient in both the lateral and anterior positions.

The solutions suitable for pyelography are (1) 20 per cent solution sodium bromide; (2) 15 per cent solution thorium nitrate; (3) 15 per cent solution sodium iodide, and to this last solution the author is partial.

To say that there is a shadow in the region of the right kidney or in the region of the gall-bladder does not furnish the surgeon with sufficient information. The exact location should be given whenever possible to search it out and no means should be spared to arrive at a definite diagnosis. Cooperation with the surgeon is necessary but one should not be unduly influenced in rendering his opinion.

The Tube Shift Maneuver in the Demonstration of Ureteral Calculus. CHARLES D. ENFIELD, M. D., F. A. C. P., Urologic and Cutaneous Rev. 28:263-265, May, 1924.

A CASE is reported to demonstrate the "beauty of the lateral shift

method of proving a suspicious shadow to be an ureteral calculus."

The usual examination of the urinary tract by two or more films over the Bucky diaphragm is first made. The author prefers two 14 by 17 films, one made with the iliac crest about an inch above and the other with the crest about an inch below the midpoint of the Bucky diaphragm. At the same or a subsequent session the urologist introduces an opaque catheter into the ureter on the affected side, preferably on a table fitted for both cystoscopy and radiography and another film is made with the patient in such position that the lower portion of the urinary tract is centered on the Bucky. The film is at once developed before the catheter is withdrawn and if it shows the suspicious shadow definitely not overlying the shadow of the catheter it cannot be an ureteral calculus.

However, if the abnormal shadow does touch or overlie the catheter shadow at any point there will still remain a question as to whether it is a calculus within the ureter or merely a phlebolith or gland which happened to be in line with the catheter and the tube target, but which is, in fact, either behind or in front of the ureter. To clear up this point a double exposed film is used. An exposure identical with the second one made above is made, then, with the patient in exactly the same position and still holding his breath if that is possible, the tube is shifted in the transverse axis of the patient's body about two inches, the Bucky is reset, and a second exposure of the same duration is made on the same film. If the abnormal shadow is indeed that of calculus in the ureter its shadow will show exactly the same amount of lateral displacement with the shift of the tube that the catheter shows. Both of the two pictures on the single film will show the abnormal opacity overlying the catheter shadow.

Uterine Hemorrhage in the Adolescent Patient Treated by Irradiation. DAVID Y. KEITH, M. D., Urologic and Cutaneous Rev. 28:297-299, May, 1924.

CONTRA-INDICATIONS for the use of radium in these cases are the same as in other cases, such as inflammation of tubes or ovaries, extreme malposition or pelvic infections. In many cases examination under anesthesia is necessary.

Dosage: In the author's series of cases no case has been given more than 300 mg. hrs. of radium with 0.5 mm. brass or silver filter. If no

more than 100 mg. hrs. are given then no paraffin, beeswax or rubber is used to protect the endometrium. Most cases which have no demonstrable pathology can be cured with doses not exceeding 200 mg. hrs., given in divided doses. Some definite indication should be present before more than 100 mg. hrs. are given for an initial dose.

Treatment should be in the hands of a well trained radiologist who has had surgical experience in gynecology, or else should be in the hands of a gynecologist and obstetrician familiar with the use of radium.

No curettage has been performed on any of the author's cases unless it had been done previously. In cases unusually nervous or sensitive an anesthetic may be required for giving the radium. Gradual dilatation is practiced. The screens used have been brass or silver as noted above and the amount used has been 50 mg. radium element distributed in twelve and one-half milligram needles of the non-corrosive type.

A Flexible Arrangement for the Simultaneous Radiation of a Patient With Three Tubes. WILHELM STENSTROM and THEODORE MUELLER. J. Cancer Research 8:22-29, April, 1924.

THE authors have designed a tube for their purpose which they have used for a year with great satisfaction. Its valuable features are that: (1) The arm can be swung around the axis and fixed in any direction without danger of tipping the stand. (2) The arm is raised and lowered with worm and gear, and stays where placed without any clamping. A centimeter scale is provided in order to facilitate a correct setting. (3) The tube can be moved back and forth in a similar way. (4) It can also be tilted in any direction and the angles can be read on scales with an accuracy of one degree. (5) The arm can be tilted against the axis over 120 degrees and the tube can be raised 2.8 meters above the floor, though the stand is only two meters high.

The usually exhausted condition of the patient after an x-ray treatment was found to be much less marked after the author hit upon the method of shortening the exposure time by using two or three tubes simultaneously over the same area.

"A special wooden table was constructed with a cradle for the tube below; this table can be moved in a perpendicular direction so that it permits three different focal skin distances 60, 70 and 80 cm. Over

this cradle an opening is cut into the table large enough for the largest skin areas. A lead diaphragm immediately below this opening can be adjusted so that smaller fields of any size may be radiated. The whole table with the exception of the opening is covered by lead rubber in order to prevent undesired radiation of the patient's body. On top of this is placed the mattress. The center of the opening is marked on the mattress and the patient is so placed that the center of the skin area corresponds with this marking on the mattress. Measurements have shown that the absorption of the rays by the mattress is so small that it can be omitted in calculating the dose. The other two tubes are on movable tube stands and can be placed at any distance, direction, and position laterally and above the patient's body. These tubes, arranged in parallel, take their current from the one machine, the lower tube is connected with the other machine. The protection of the patient must be so arranged that each of the two upper areas receive radiation only from one tube and are absolutely protected against radiation from the other tube. This is best done by placing a sheet of lead rubber in a perpendicular position between these two fields. The capacity of the modern machine is sufficient to carry the load of two tubes operated at 6 or even 8 ma. over a long period.

"It is evident that cases which can be treated by cross firing from three skin areas like most of the cases of malignancy of the bladder and rectum, require only one setting up of the patient and their treatment is usually completed in 80 or 90 minutes.

"Patients with carcinoma of the uterus are treated in our institute according to the Dessauer method, which consists of four large fields through the abdomen, the back and both sides. In these cases as a rule the one lateral field is first radiated with two tubes simultaneously over the same field. The necessary dose for this field is obtained in about 40 minutes. The patient is then turned on her back and the remaining three fields are given with three tubes at the same time as described above. The whole treatment does not require more than two and one-half hours."

It remains to be seen whether the reaction of the tumor is better after this method of treatment but the authors are very hopeful of the results.

2865—Radio—6-18-24 (33)
Role of Radium in Benign and Malignant Tumors of the Uterus.
 THOMAS E. JONES, M. D., Illinois
 M. J. 45:255-258, April, 1924.

IN the Cleveland Clinic at the present time all cases of carcinoma of the cervix are being treated with a combination of radium and deep x-ray therapy. Carcinoma of the fundus should be treated by surgery, this author believes. Fibroids associated with pain in the pelvis or with discharge from the uterus should not be radiated if the cervix is normal. Radium is the treatment of choice for menorrhagia at any age and is especially indicated in cases of menorrhagia at the menopause with slight enlargement of the uterus.

Technique and Results in the Treatment of Carcinoma of the Uterine Cervix at "Radiumhemmet," Stockholm. H. V. JAMES HEYMAN, M. D., J. Obst. Gynec. Brit. Emp. 31: No 1, 1-17, Spring, 1924.

AS a rule only three applications of radium are made. The second application is made one week after the first application and the third application three weeks after the second one. Radium is applied both in the vagina and in the uterus at each treatment, if this is possible. Length of time for each application is twenty-two hours; 33.7 or 40.1 mgm. el. is used in the uterus three times, making a total dosage of 2220-2640 mgm. el. hours; in the vagina 70 mgm. el. is used three times, total dosage equaling about 4500 mgm. el. hours. The radium is always filtered through 0.75 mm. lead.

During the last three years the author has tried a more concentrated treatment, the number of applications being reduced to two, 32 and 24 hours respectively. In such cases the total vaginal dose has been limited to 4000.

All operative interference at the commencement of the treatment, such as cauterization and excochleation, is absolutely contra-indicated. The treatment is never repeated within the first six months. However, if within six months after the three applications already mentioned, the growth has not disappeared, or if there is a recurrence the treatment may be repeated, though preferably not until a year after the first treatment. Only one application is then made.

Clinically healed patients, as well as patients with a suspected "reactive" inflammation are not treated again until a recurrence has been definitely proved. If there is a local recurrence and the growth is operable hysterectomy is performed. If there are extensive glandular metastases

roentgen irradiation is used in conjunction with the radium treatment. It is used also if severe pains persist after the radium treatment and if there is a recurrence in the parametria. Massive doses are not employed.

The period reported covered the eight years from 1914 to 1921. The number of cases with carcinoma of the cervix and primarily treated, numbered 505. The number of borderline cases and inoperable cases comprised 91.2 per cent for the first five years and 68.4 per cent from 1919 to 1921. One-third of the patients were under 46 years of age and 19.1 per cent were 40 years of age or under. All the patients who have died have been counted as dead due to cancer. The higher percentages of symptom free patients during the period of 1919 to 1921 is largely attributed to improved technique.

The results are given as:

TOTAL CASES.

1914-1918—20.29 per cent free from symptoms after 5 years of age.

1919—27.6 per cent free from symptoms after 4 years.

1920—30.9 per cent free from symptoms after 3 years.

1921—31.1 per cent free from symptoms after 2 years.

OPERABLE OR BORDERLINE CASES.

1914-1918—40.5 per cent free after 5 years.

1919—47.3 per cent free after 4 years.

1920—60. per cent free after 3 years.

1921—58.3 per cent free after 2 years.

INOPERABLE CASES.

1914-1918—16.6 per cent free from symptoms after five years. Of the remainder, 20 to 25 per cent, varying with the year, were free from symptoms after three years.

If the local recurrence takes place it takes place within a year, as a rule, but glandular recurrence and metastases may supervene after years of apparently good health.

Complications due to radium treatment are due to overdosage, and are chiefly rectal and appear, as a rule, six months after the treatment. They include tenesmus and hemorrhage. Since 1915 the author has had no case of fistula. Five patients died of diffuse peritonitis and sepsis as the result of the treatment and one died of pulmonary embolism. The primary mortality is 1.19 per cent.

Radiation Therapy of Cancer of the Uterus. U. V. PORTMANN, M. D., Am. J. Obst. & Gynec. 7:536-540, May, 1924.

THE author believes that treatment of carcinoma of the cervix will ultimately be entirely confined to radiation therapy, since end-results seem to prove that the use of radium and x-ray is the method of choice. In the author's cases there has been immediate cessation of hemorrhage and pain, more rapid healing of the local lesions, early softening and disappearance of induration and more rapid convalescence than after any other mode of treatment. The least successful of his cases have been those where operative procedure preceded radiation. He believes that cauterization, if employed, should be followed immediately by irradiation. Radiation should follow curettement or any excision of tissue unless it be for diagnostic purpose only.

He says it must be remembered in any comparative study of the results of radiation and surgery that it is the surgeon who determines the operability of a case and that it is only within recent years that any except inoperable cases have been treated by radiation alone.

In carcinoma of the fundus he quotes Doctor Crile's percentage (26.3 per cent surviving for five years) and he says he thinks it doubtful whether radiation therapy can improve the results so far attained by surgery, however, the predominating types of this lesion yield well to radiation therapy and possibly time will prove radium and x-ray to be the method of choice.

An inflammatory condition renders intensive radiation extremely dangerous but the author does not believe that a bad general physical condition or severe systemic disease necessarily contra-indicates irradiation if a slow procedure is followed and if blood transfusion is resorted to whenever necessary.

The Role of Radium in the Treatment of Carcinoma of the Uterus.

THOMAS E. JONES, M. D., Am. J. Obs. & Gynec. 7:541-542, May, 1924.

THE cases of carcinoma of the cervix subjected to radium therapy during the last four years at the Cleveland Clinic are divided into three groups: (1) inoperable cases treated with radium alone; (2) cases subjected to both surgical and radium treatment; (3) those treated with both radium and deep x-ray therapy.

The results in the first group have been excellent, 45 per cent are well after three years. The second group has shown very bad results and the combined treatment has been abandoned. No details are given, except

that these were the only cases in which fistula appeared. The third group shows the best results so far, but the method has been in use only one year, therefore no conclusive opinion can be given. There have been no deaths attributable to radium.

Radiation is not advocated for carcinoma of the fundus since the results of surgical treatment are excellent.

Relative Values of Irradiation and Radical Hysterectomy for Cancer of the Cervix. JOHN G. CLARK, M. D., and FRANK B. BLOCK, M. D., Am. J. Obst. & Gynec. 7:543-549, May, 1924.

ACCORDING to surgical statistics the world over, there is scarcely an anatomic situation in which surgery offers less hope than it does in cancer of the cervix. The author's own cases have shown a five year cure of 33 per cent and for the last three years they have abandoned radical operation except in the absolutely favorable type of cases, a small number compared to the number of borderline and hopeless cases. While irradiation falls far short of the ideal it compares most favorably with radical operation and it is of inestimable palliative value and is of curative value in a small percentage of cases. The authors, while themselves preferring radiation, except in the type of case absolutely favorable to surgery, have no quarrel with the skillful specialist who adheres to the radical method, providing he uses postoperative treatment. They express doubt as to the value of preoperative treatment but have not yet come to a definite conclusion regarding its value.

A Case of Melanosarcoma Treated With Roentgen Rays. ARTHUR K. OWEN, M. D., Am. J. Roentgenol. 11:335, April, 1924.

THE patient in this case was a woman aged 59. A small mole had always been present on the right forearm and late in the year of 1919 it grew larger and somewhat painful. It was cut off at that time by a pair of scissors, recurred and was treated with paste which did not affect it. Then a physician tried to tie it off with a fine wire whereupon profuse hemorrhage occurred, only the top being removed. The tumor then continued to enlarge from the base and reached a size of four by three centimeters and projected three centimeters above the skin surface. A surgeon diagnosed it melanosarcoma (microscopic examination) and advised amputation of the arm. This the patient refused to have done.

In July, 1920, roentgen treatment was begun. The tumor soon subsided and except for a depressed scar and several areas of pigmentation where the tumor had metastasized there was no sign of any trouble when the patient was last seen in August, 1923.

Treatment is thus described: "On three successive days, a half hour of unfiltered x-rays over the tumor mass, a total of one and one-half hours in the three days. A 10 in. spark gap measured between blunt points, 5 ma., and 10 in. target skin distance were used. Tumor exposed through an opening in sheet lead which extended one-half centimeter beyond the margin of the tumor. On the same three days the entire arm from wrist up, the axilla, shoulder and the right chest received an hour each day of filtered rays (three hours total) using a 10 in. spark gap, 5 ma., 14 in. target skin distance; 6 mm. Al and 5 mm. leather. Each skin area received thirty minutes. A month later the elevation of the tumor was found to be reduced but its circumference slightly increased. Another half hour of unfiltered rays (10 in. spark gap, 5 ma., 10 in. target skin dis.), was given over the tumor, and one and one-half hours of filtered rays (6 mm. Al, 5 mm. leather), were given over the arm, axilla and chest with a target skin distance of 14 in. The same dose was repeated the three following months. Again at the end of three months three more treatment were given (February to April), after which treatment was discontinued but patient ordered to report back every three months.

The Metabolic Changes Associated With X-Ray and Radium Treatment. E. C. DODDS, M. D., and J. H. DOUGLAS WEBSTER, M. D., M. R. C. P., Brit. J. Radiol. 19:140-147, April, 1924.

EXACTLY similar results were found in patients treated with x-rays or with gamma rays.

The changes in metabolism produced in the patients were found to vary with the site irradiated and are summarized as follows: (a) irradiation of the head, thorax and limbs produced no change in the metabolism. (b) Radiation of the abdomen and spleen produced definite urinary and blood changes. There was a sudden fall in the 24 hour amounts of the following urinary constituents: urea, uric acid, ammonia, titratable acidity, creatinine, total nitrogen and phosphates. The volume of the urine was greatly decreased. After about three days the excretion of these substances rose to about normal. The

24 hour amounts of uric acid and phosphates continued to increase after the original level had been reached but returned to normal in about five days. The chloride content and diastase showed an immediate increase, returning to normal in three to six days. The ammonia coefficient showed an increase for about three days, falling to normal in six days. Blood analysis showed a marked decrease in the urea content, with very little change in any other of the blood constituents. These results were obtained in every case of this group investigated. There was an increase of fecal fat content.

From these results the authors conclude that the effects of radiating the abdomen can be explained by a temporary inhibition of the functions of the principal abdominal glands such as the liver, pancreas and kidneys. Their figures give no support to the acute uremic theory of Anderson and Kohlmann. No evidence of nitrogen retention could be obtained, such as would be expected if uremia had been induced. The rise in the ammonia coefficient following radiation is in agreement with the acidosis theory of Lang. The increase in fecal fat content supports the work of Whipple and Hall. The fall in the urea content of the blood they find very difficult to explain but think it may have been brought about by a temporary inhibition of the metabolic functions of the liver.

Radiation of the cervical region produced only one effect upon the metabolism, namely, an immediate fall in the excretion of urinary creatinine which almost disappeared the first day, recovery not taking place until the fourth day. There was no alteration found in the blood creatinine content.

Three cases of very well marked x-ray sickness were examined but no change in their metabolism following exposure to x-ray could be detected, the sickness seeming to be physical.

A number of cases were treated prophylactically with calcium chloride, etc., before irradiation, a few were treated with sodium bicarbonate; all such cases showed less reaction.

The Physiological Action of Ionizing Radiations. Comparisons of Beta and X-Rays. ALFRED C. REDFIELD, ELIZABETH M. BRIGHT and JEANNE WERTHEIMER, Harvard Medical School. Am. J. Physiol. 78:368-378, April, 1924.

THE relative effectiveness of beta and x-rays depends on some factor additional to the intensities and absorption coefficients of these radi-

ations. This factor is considered to be the degree to which ions formed by the various radiations tend to recombine. It is shown that when this tendency is the same for beta and x-rays the relative physiological effects and ionizing powers are also of the same general order. Characteristics of the relation between intensity of radiation and the velocity of the physiological reaction under x-radiation suggest that the effects are due to the formation of dense ionization fields in the paths of the secondary corpuscles. This conception explains observed differences in the action of beta, gamma and x-radiation. The temperature coefficient of the physiological change under x-radiation is 1.1.

The Practical Measurement of X-Ray Quantity and Quality in Standard Units. ROBERT A. ARENS, M. D., and H. N. BEETS, B. S., *Urologic and Cutaneous Rev.* 28:259-261, May, 1924.

THE x-ray dosage applied to a patient can be determined indirectly by measuring the electrical energy consumed in the production of the x-rays; or it can be measured directly by measuring the quantity and quality of the x-rays produced. This last method is the more logical.

Both methods are discussed in detail. The sphere gap is commonly used to measure high voltage directly and in doing this it must be kept in mind that the supporting posts may become loosened and allow the spheres to be actually closer together or farther apart than they should be.

The voltage impressed on the tube is measured indirectly by the kilovoltmeter and it is astounding that any radiologist should use this kilovolt reading for voltage regardless of the milliamperes employed, because a change of from two to four or of three to six in milliamperage will cause a great change in voltage on the high tension side while only a small change will be apparent on the kilovoltmeter. Therefore, when the milliamperage is changed the machine should be reset.

The autotransformer is a very efficient and satisfactory instrument to control voltage but it is a serious mistake for two operators using the same machine to use the same control settings unless they first check up their output.

The thickness of the filter is of extreme importance and the filter's thickness should be stamped in decimals upon it; otherwise a severe burn may result when administering a dose very near the danger point, since, for example, filters marked $\frac{1}{2}$ mm. have

been found to vary from .58 mm. to .35 mm.

A single milliammeter should never be used although they are probably the most accurate of any device on the market.

The pastille method is condemned because of its safety factor not being within reasonable limits.

Also the authors object to the use of the Fuerstenau intensimeter because the selenium fatigues and does not give constant readings.

The ionization chamber method they account as the best method of measuring x-ray intensity and they discuss it in detail.

The authors do not believe that dosage should ever be stated in terms of erythema but in terms of electrostatic units with a given wave length. This method permits accurate comparisons of dosages by the same or different radiologists.

Modern Radiographic Technique. L. G. HEILBRON, Amsterdam. *Brit. J. Radiol. Roentgen Soc. Sect.* 20: 53-58, April, 1924.

MEASURING the spark gap to determine the hardness of the tube has never been popular in Holland. In the case of "gas" x-ray tubes the author uses the milliammeter to measure hardness. He calibrates the milliammeter by a Benoist pentrometer. He says that for Coolidge tubes, voltmeters on the primary have come into fashion and while the method is not without faults it is sufficient for the radiographic work.

He is a great admirer of x-ray spectroscopy and believes it a scientific way of measuring secondary voltages but thinks it is not yet of practical value to the radiographer and would not use it himself in his laboratory.

He has an idea that the Bucky principle could be used with common light and that with a small Bucky diaphragm made of glass and some opaque material he believes it might be possible to intercept scattered light. He has some experiments under way in this direction.

Studies in X-Ray Production. J. A. CROWTHER, Sc. D., *Brit. J. Radiol. Roentgen Soc. Sect.* 20:61-72, April, 1924.

SIMULTANEOUS records were made of the instantaneous values of (a) the potential, (b) the current through an x-ray tube, and (c) the intensity, (d) the quality of the radiation emitted at each point of the discharge for Coolidge and gas-filled tubes on different potential generators. Oscillograms are shown illus-

trating the various combinations of apparatus. The following general conclusions are drawn:

(1) The intensity of the radiation is proportional at each point to the product of the instantaneous values of the current and the square of the potential.

(2) The Coolidge tube behaves as a thermionic valve, working usually at far beyond its saturation voltage. It is thus a constant maximum current device. The lack of proportionality between current and output for a Coolidge tube on an induction coil is shown to be due to a change in wave form of the secondary potential of the coil with decreasing resistance in the tube.

(3) The peak current i through a gas tube is proportional to $V^2 \cdot V_0^2$, where V is the peak potential and V_0 the breakdown voltage of the tube.

(4) On open circuit the peak voltage in the secondary is proportional to the instantaneous value of primary current at break.

(5) If the secondary is connected through a gas-filled tube the square of the peak voltage is approximately proportional to the current at break.

(6) The discharge through a gas-filled tube on a transformer is oscillatory, the period being about 2,000 per second. The breakdown voltage for the tube increases during each discharge, but returns to normal during each succeeding interval of rest.

(7) Peculiarities in the behavior of electrolytic breaks are recorded.

On the Quality of the X-Rays Excited in Hot Cathode and in Gas Tubes by Various Types of Generators of High Tension Current. H. MOORE, A. R. C. Sc., *Brit. J. Radiol. Roentgen Soc. Sect.* 20:73-95, April, 1924.

The author's own summary reads as follows:

THE x-radiation excited in different forms of x-ray tubes operated by different forms of high tension generating apparatus has been investigated (a) by absorption methods, (b) by spectrum analysis of the radiation, using an ionization spectrometer. The types of generating apparatus used were: (1) an introduction coil, (2) a Snook apparatus, and (3) high tension direct current generators (two forms). The results show that, arranged in the order in which the x-radiation excited is of minimum heterogeneity, the methods of excitation can be placed as: (1) Either type of tube operated by a constant voltage generator. (2) Gas tube working at a large alternative spark gap either on a Snook apparatus or on an introduction coil. (3) Gas

tube working at a *medium alternative* spark gap on a Snook apparatus or on an induction coil. (4) Coolidge tube operated by a Snook apparatus. (5) Coolidge tube operated by an induction coil, particularly with large currents passing through the tube.

Comparisons of the various spectra show that the quality of the x-ray beam obtained from an x-ray tube operated by an induction coil or by a transformer, can be estimated only in a very approximate way by measurement of the alternative spark gap at which the tube is operating.

The spectra indicate that a Coolidge tube is less efficient than a gas tube when operated by either a Snook apparatus or by an induction coil, but that the tubes are equally efficient when operated by a constant voltage generator.

In conclusion it is pointed out that a constant voltage generator possesses the following advantages over the types of generators in common use: (a) The x-radiation obtained is as nearly homogeneous as is possible to obtain from an x-ray tube, its quality depends solely upon the voltage applied to the tube. (b) The efficiency of the generation of x-rays is greatest when this form of generator is used. (c) The quantity of the radiation excited can be measured (for any particular voltage) in terms of milliamperes seconds. (d) The quality of the x-ray beam can be determined at once from the voltage applied to the tube, or can be altered in a known manner by altering the applied voltage. (e) The use of a constant voltage generator would enable accurate dosage measurements to be made and would enable a particular dose to be repeated with exactitude.

X-Ray Diagnosis in Mastoid Disease. Editorial, Atlantic M. J. 27:442, April, 1924.

SERIOUS mastoid disease may be present and give no symptoms and even though a diagnosis of mastoid disease has been made, a skillful x-ray examination will yield valuable information. In all leading otologic clinics an x-ray examination is routine. The examination involves no

risk and no pain, although in very young children chloroform may be given for an anesthesia of a few minutes duration. Both mastoids should be examined and sometimes from several angles and it should be remembered that in very young children and in some adults the mastoid cells are not developed.

In the earliest stages one will find a general cloudiness over the mastoid region but one should be on the lookout for fogged negatives as they are deceiving in this respect. In this early stage the cell walls are still preserved.

In the acute suppurative mastoiditis there will be absorption of lime salts and either local or general destruction of the cell walls; this destruction appears oftenest at the antrum, at the knee of the lateral sinus, and at the tip of the mastoid. In an early stage there will usually be some thickening of the anterior wall of the lateral sinus, making it stand out more clearly, but when destruction takes place all evidence of the wall may disappear.

Chronic or recurrent cases after operation will usually show considerable sclerosis and perhaps necrosis or sequestra.

Definite demonstration of disease, general character and distribution of the mastoid cells and the definite location of the lateral sinus will help the aural surgeon to decide as to operation and will be of material assistance in his performing the operation.

Effect of Radiation of the Bactericidal Power of the Blood. L. COLEBROOK, A. EDINOW, and LEONARD Hill National Institute for Medical Research and St. Mary's Hospital, London.

THESE workers found by experimentation that both the serum and leukocytes contribute to an increased bactericidal effect achieved by the blood of rabbits after exposure to various radiations which produced inflammation of the skin. An increase in hemobactericidal power was also found in pigs, and to a less extent in man. It is suggested that the products of the damaged tissue cells evoke this reaction.

The Effect of X-Ray on the Skin of Vitrally Stained White Mice. G. T. CORI, M. D., J. Exper. Med. 39:639-643, May, 1924.

THE x-ray unit defined as causing total spontaneous epilation of the skin of the mouse was found to correspond to four to five human erythema doses. It was found that the time interval between radiation and the occurrence of epilation in mice injected with trypan blue was shorter than in normal animals.

The Effect of X-Ray on Bone Marrow. ERNEST H. FALCONER, M. D., LAIRD M. MORRIS, M. D., and HOWARD RUGGLES, M. D., Am. J. Roentgenol. 11:342-351, April, 1924.

DIRECT roentgen ray radiation of the long bones of the dog in both light and heavy dosage did not appreciably stimulate or decrease the contained marrow cells. Repeated small doses over the spleen caused a slight increase in the number of cells in the marrow of the right and left tibia of the dog, also there was noticed an increase in the proportion of immature marrow cells. X-radiation over the spleen produced a rise in the number of platelets in the peripheral circulation, which rise was maintained through the experiment. The general condition of both animals was improved during the experimentation and the hemoglobin and red cells increased. No untoward results were noted as a result of frequent bone-marrow punctures.

The Effect of Direct Radiation over the Precordium on the Heart Size, the Heart Mechanism and the Myocardium of Rabbits. BURGESS GORDON, M. D., G. F. STRONG, M. D., and E. S. EMERY, JR., M. D., Am J. Roentgenol, 11:328, April, 1924.

NO definite changes in heart size or histology suggested that direct radiation over the precordium caused a diseased myocardium in rabbits. The pathological findings were not unlike those described in cases of infection and nutritional disturbances. Variations in the mechanism occurred in only one animal.